NOVEMBER 14, 1936

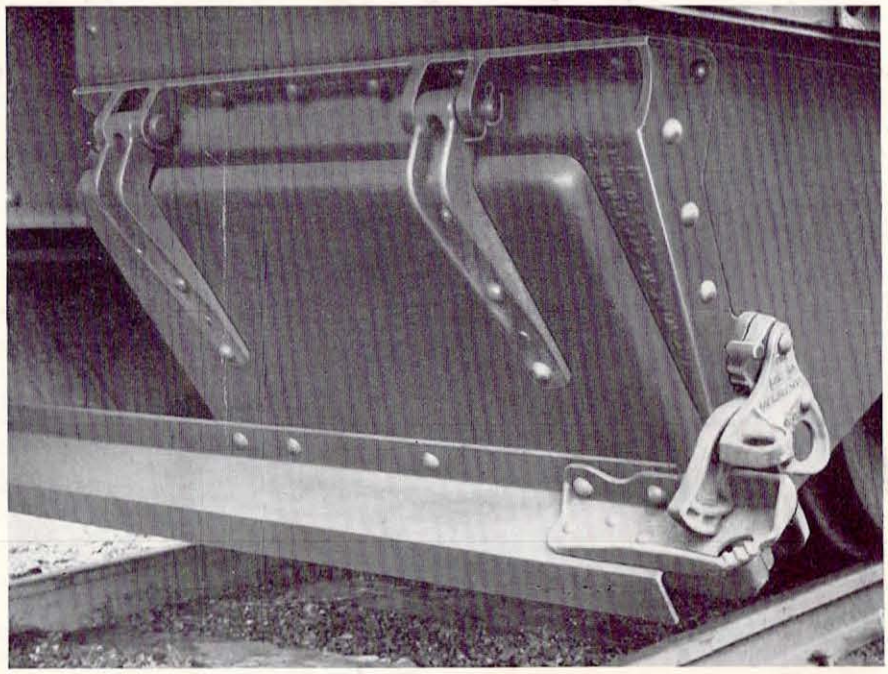
Railway Age

Founded in 1856

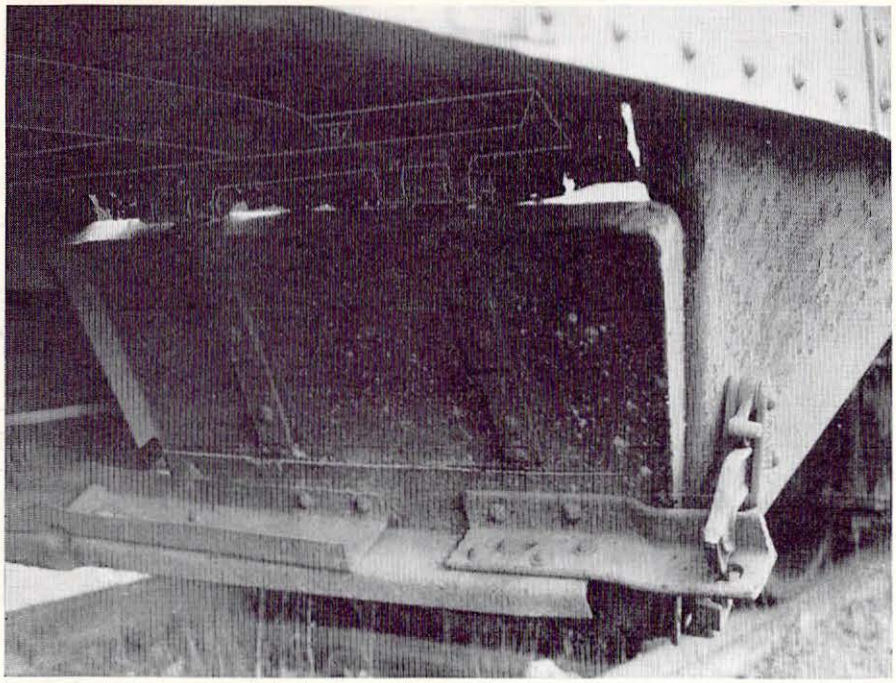
CARTNEY LIBRARY
GENEVA COLLEGE

INCREASED
STRENGTH
PERMANENCE
RUGGEDNESS
STABILITY

WITH



WINE HOPPER FRAMES



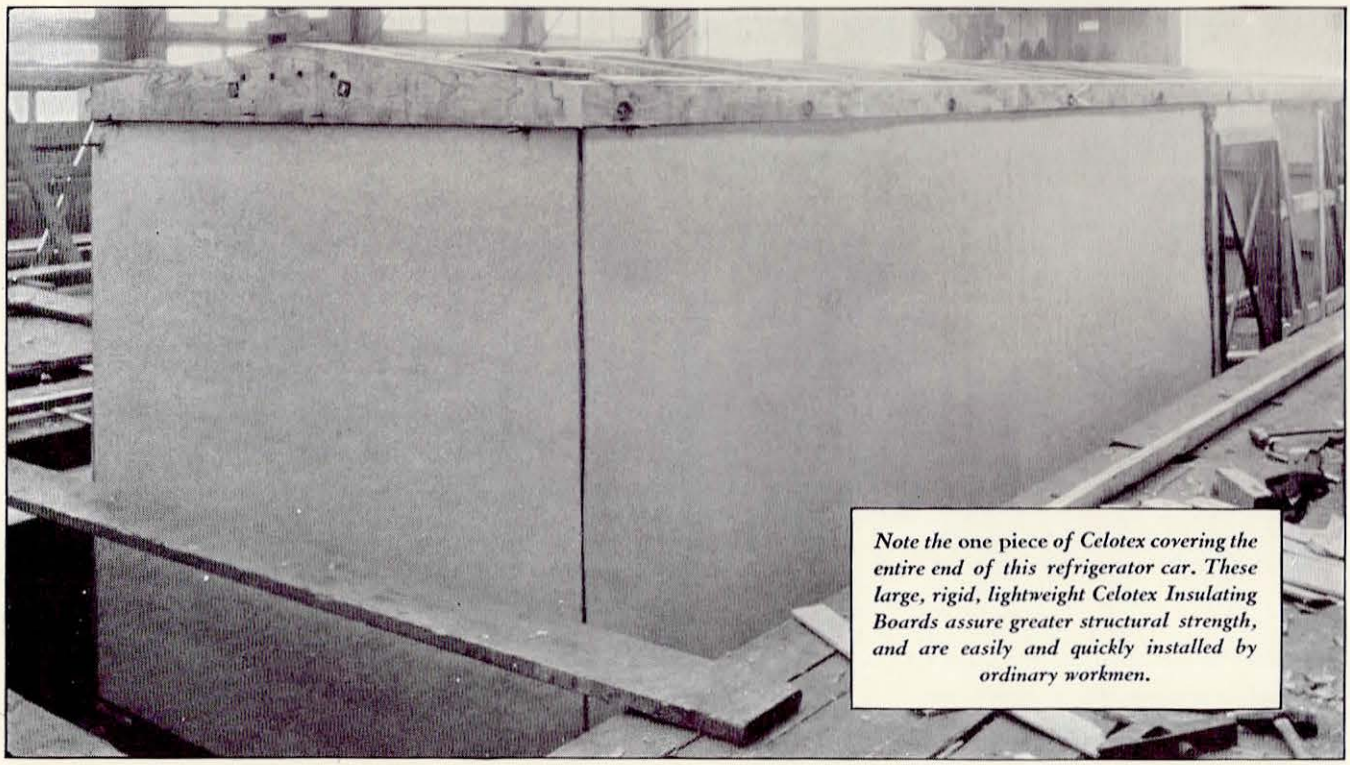
WITH-
OUT

WEAKNESS
DETERIORATION
CORROSION
DISTORTION

THE WINE RAILWAY APPLIANCE CO. TOLEDO, OHIO

CELOTEX REFRIGERATOR CAR INSULATING BOARD

Is Easily, Quickly Applied . . .
Provides Greater Structural Strength



Note the one piece of Celotex covering the entire end of this refrigerator car. These large, rigid, lightweight Celotex Insulating Boards assure greater structural strength, and are easily and quickly installed by ordinary workmen.

CELOTEX—in large-size, rigid insulating boards for refrigerator cars—*provides efficient insulation plus structural strength* at ONE material cost.

Its *light weight* decreases hauling costs. Its *ease of handling* keeps down car construction costs. It is *durable*—it doesn't settle or shift, it resists moisture absorption, and it's *permanently* protected from destruction by Dry Rot, Fungus Growth and Termites by the patented Ferox Process.

Our refrigerator engineers will gladly advise you on refrigerator car insulation problems. No obligation. Write to address below.

THE CELOTEX CORPORATION • 919 NORTH MICHIGAN AVENUE, CHICAGO, ILLINOIS

World's Largest Manufacturer of Structural Insulation

CELOTEX

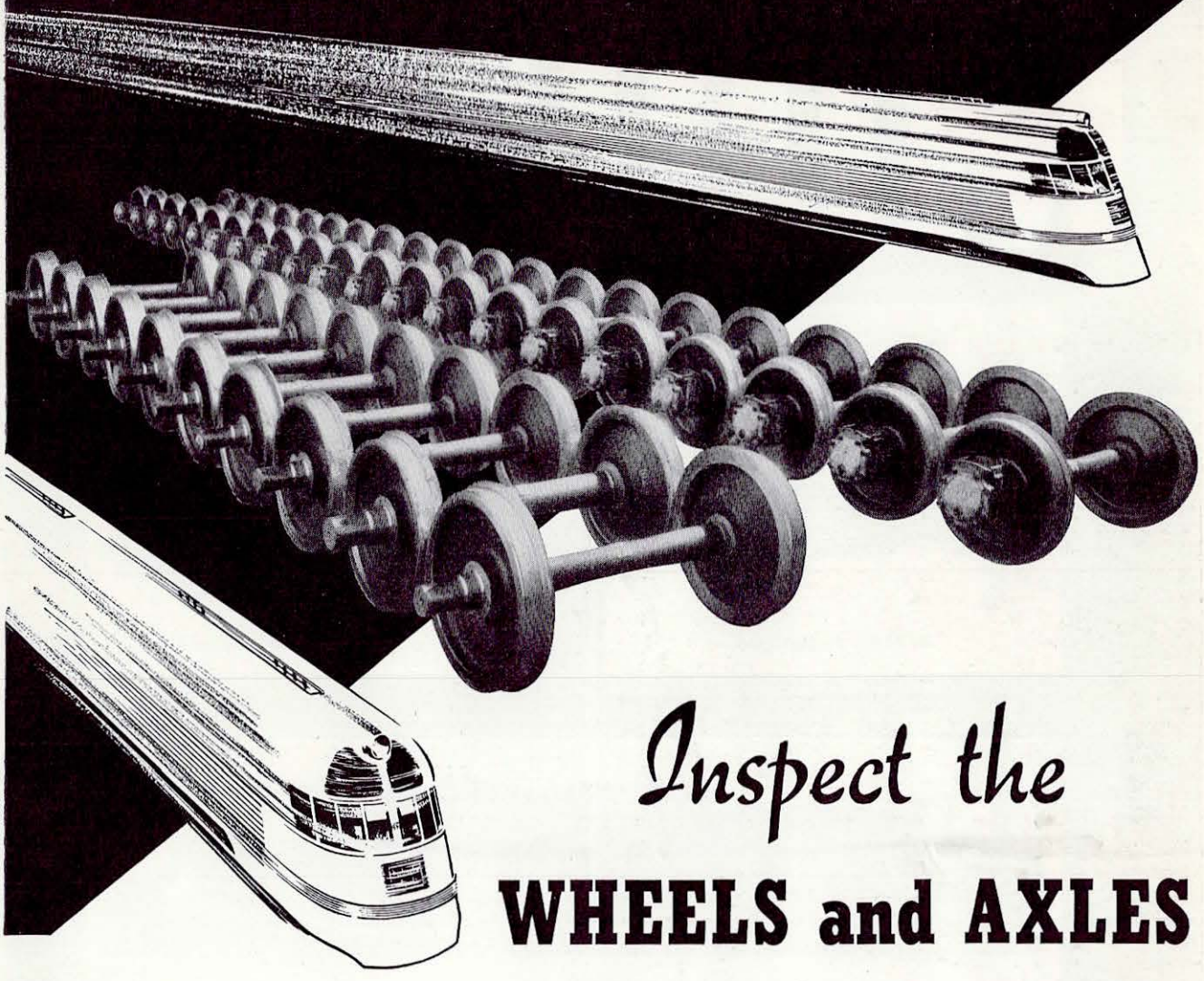
BRAND

INSULATING CANE BOARD

REG. U. S. PAT. OFF.

Published weekly by Simmons-Boardman Publishing Corporation, 1309 Noble Street, Philadelphia, Pa. Entered as second class matter, January 4, 1933, at the Post Office at Philadelphia, Pa., under the Act of March 3, 1879.

TO ROADS THAT OPERATE HIGH-SPEED TRAINS



Inspect the WHEELS and AXLES *of the* Denver Zephyrs

FOR HIGH-SPEED TRAINS, particularly those of light weight, wheels are more than just wheels—they become a real problem, involving maintenance, comfort, and safety. Perhaps that's why all the Zephyrs roll on Bethlehem wheels and axles.

To manufacturers of these trains, to engineers who design them, and to superintendents of motive power responsible for keeping them on the road—we offer help. Our experience has been gained from four years of work on this specific problem—research and development which started with the first Zephyr and which still continues—skill which has led to the use of Bethlehem Wrought-Steel Wheels and Forged Axles on a dozen of these spectacular high-speed trains.

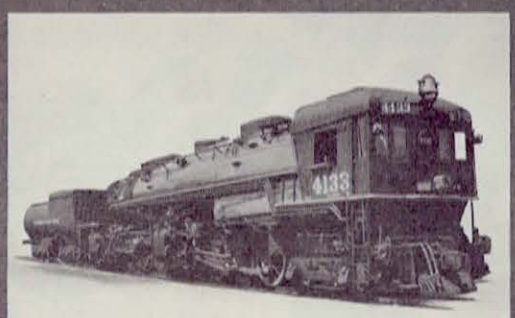
Whether it be in the working out of a tread that will make riding easier; in the use of alloys and heat-treament that cuts maintenance; in the reduction of dead, unsprung weight; or in the perfect balancing that cuts car and track maintenance—whatever the problem, let us help you solve it.

BETHLEHEM STEEL COMPANY, *General Offices:* Bethlehem, Pa. *District Offices:* Albany, Atlanta, Baltimore, Boston, Bridgeport, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Hartford, Honolulu, Houston, Indianapolis, Kansas City, Los Angeles, Milwaukee, New York, Philadelphia, Pittsburgh, Portland, Ore., Salt Lake City, San Antonio, San Francisco, St. Louis, St. Paul, Seattle, Syracuse, Toledo, Washington, Wilkes-Barre, York. *Export Distributor:* Bethlehem Steel Export Corporation, New York.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

MODERN



Southern Pacific Lines

Chicago Burlington & Quincy Railroad

Alton & Southern Railroad

In Modern Power, such as the Baldwin built locomotives shown above, many railroads have found an answer to the demand for improved service and operating economy because—

1. *Higher speeds with their standard trains, or greater tonnage at the old average speeds, enable the railroads to meet competition and attract increased business.*

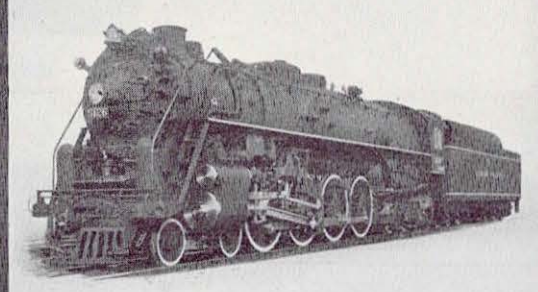
2. *Fewer locomotives are needed to handle the traffic.*

3. *The reduction in operating and maintenance costs results in better earnings.*

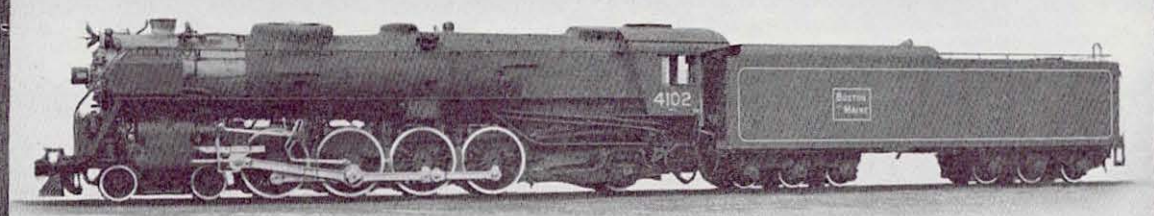
With greatly increased car-loadings now in evidence, the railroads could profitably use many more such locomotives.

POWER ON THE RAILROADS

Bessemer & Lake Erie Railroad



Lehigh Valley Railroad



Boston & Maine Railroad

THE

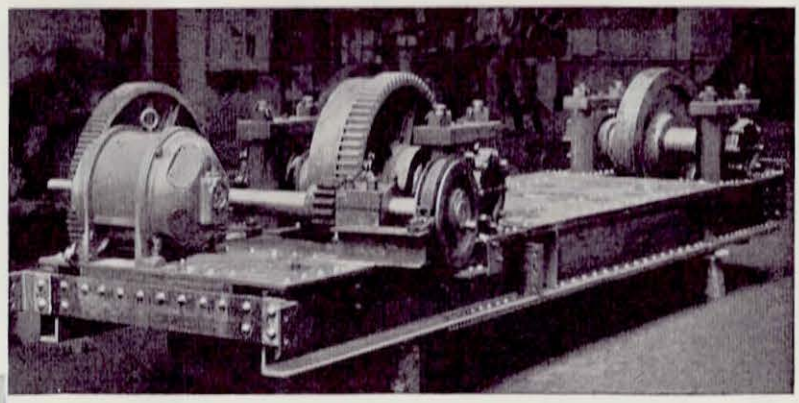
BALDWIN

LOCOMOTIVE WORKS

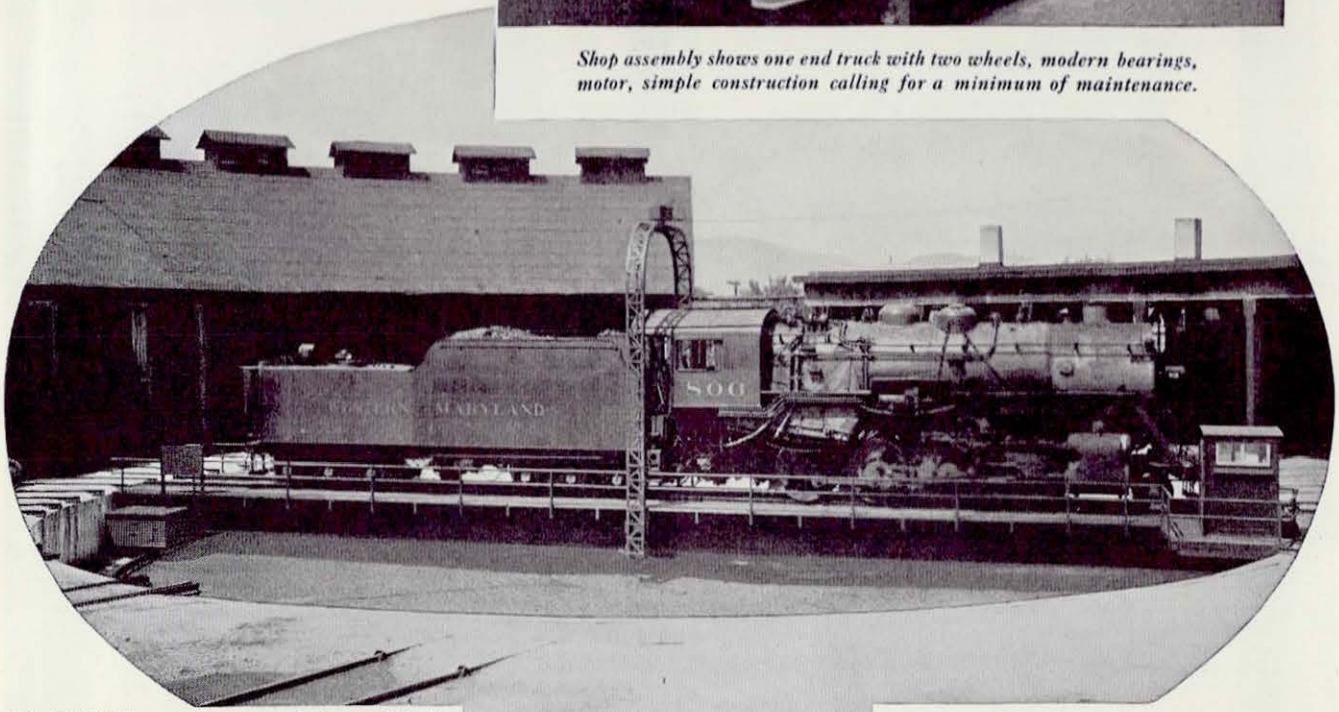
Philadelphia, Pa.

ANNOUNCING . . .

Improved American Bridge Company Turntable



Shop assembly shows one end truck with two wheels, modern bearings, motor, simple construction calling for a minimum of maintenance.



This latest American Bridge Company Standard Continuous Turntable, installed by Western Maryland Railway at Elkins, W. Va., shows the simple construction from CB sections, shallow pit, housings for easily accessible mechanical parts of end trucks.

MANY new features bring added economies of construction and operation to this latest American Bridge Company Continuous Turntable:

ADVANTAGES IN CONSTRUCTION:

1—Main girders are sturdy CB Sections, completely assembled with bracing, shop riveted in one shipping unit. No undercutting of ends for truck connections.

2—Two strong end trucks (not four), are each completely shop assembled with all mechanical parts and aligned exactly radially with main girders and center pivot. This cuts number of wheels, axles, bearings, etc. in half.

3—Heavy crane-type curved pit rail has ample bearing surfaces.

4—Disc-type center pivot carries less load than previous tables.

ADVANTAGES IN OPERATION:

1—Frictional resistance is less; construction of end trucks assures permanent and exact radial alignment with center pivot.

2—Large diameter truck wheels roll on latest type roller bearings.

3—Push button control for starting, accelerating, stopping and reversing provides ease in operation and prevents shocks.

ADVANTAGES IN MAINTENANCE:

1—All mechanical parts at end trucks are entirely outside of the main girders, accessible from all sides for oiling, cleaning and adjustment.

2—Lessened deterioration and wear are due to simplified and sturdy construction of all structural and mechanical parts.

3—Shallow pit costs less to build, is easily drained and does not require inspection recess in pit wall.

American Bridge Company Standard Continuous Turntables are self-contained machines, designed to handle suddenly applied loads and proportioned for typical locomotives within their given length. Call on us for additional information or suggestions to meet your requirements.

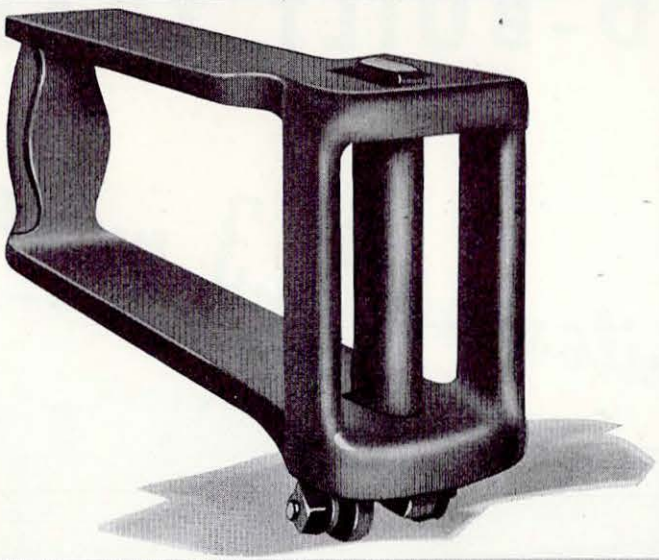
A M E R I C A N B R I D G E C O M P A N Y

General Offices: Frick Building, Pittsburgh, Pa.

Baltimore · Boston · Chicago · Cincinnati · Cleveland · Denver · Detroit
Duluth · Minneapolis · New York · Philadelphia · St. Louis

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL



JANNEY VERTICAL KEY YOKE

A coupler yoke made of cast steel for replacing wrought riveted coupler yokes.

More than sixty railroads and private car lines have replaced thousands of wrought riveted yokes with Janney vertical key yokes, eliminating the heavy expense of maintaining riveted yokes.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

ANOTHER RECORD FOR BUDD-BUILT TRAINS!

1017 miles at 83.3 miles per hour

On October 23, at 7 A. M., one of the new Denver Zephyrs, built of stainless steel by Budd, left the Union Station in Chicago. Twelve hours, twelve and one-half minutes later, this gleaming train weighing only half as much as comparable standard equipment pulled into the Denver Union Station—establishing a world's long-distance speed record.

On this non-stop run, the Denver Zephyr carried two power cars and six coaches—four sleeping cars having been dropped for the daytime run. The top speed attained was 116 miles per hour. 120 travelers on this record-breaking run had breakfast in Chicago and dinner in Denver.

And so the spectacular success of Budd-built trains continues. These swift, strong trains are built by the Budd System of Light-weight Construction—high-tensile, stainless steel, welded by the "Shotweld" process.

Originator of all-steel bodies for automobiles, now used almost universally, the Edw. G. Budd Manufacturing Co. has been for many years a leader in the design and fabrication of steel products.

EDW. G. BUDD MANUFACTURING COMPANY

RAILWAY DIVISION: PHILADELPHIA

BUDD METHODS SAFELY ELIMINATE DEAD-WEIGHT

Here's what the engineer says about CBP SECTIONS

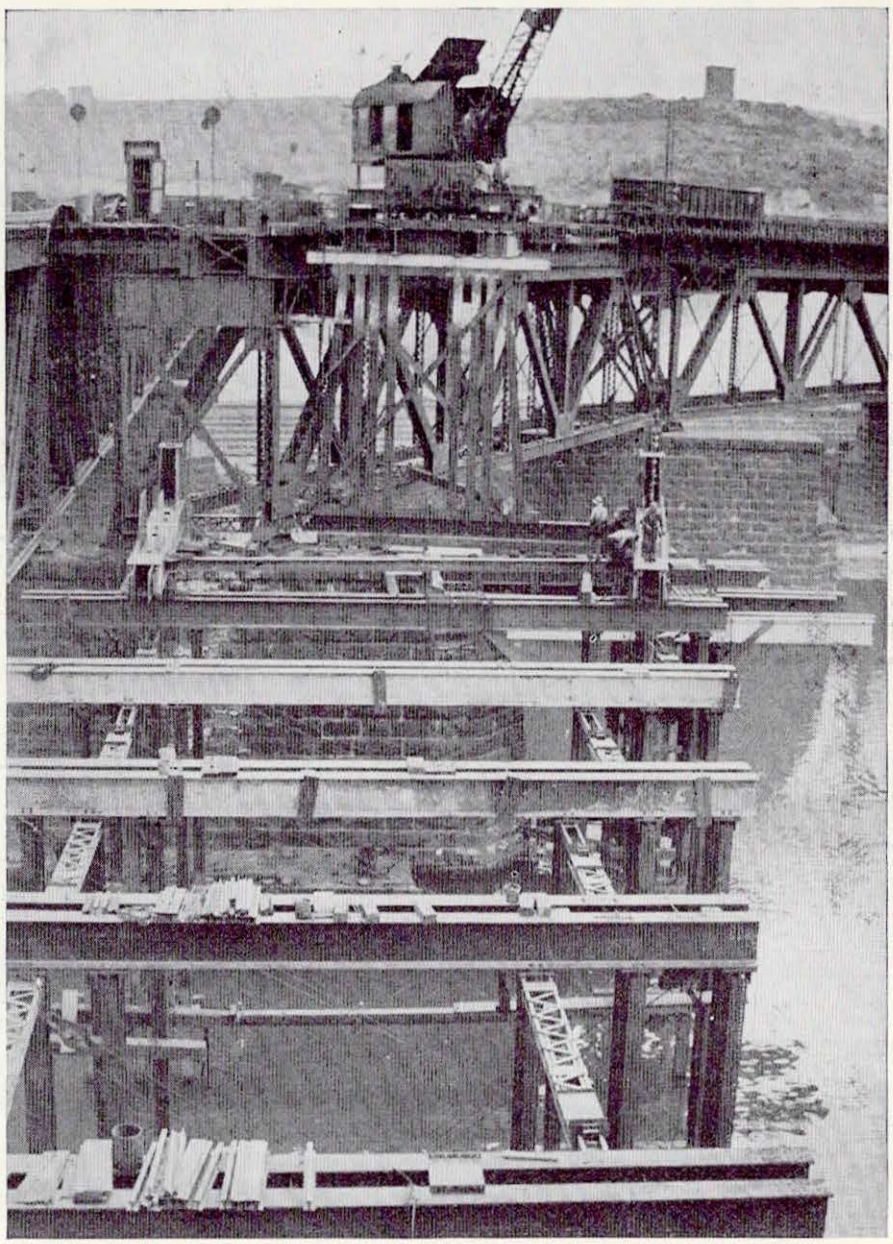
"IN February we began the replacement of 4 spans of the Union Railroad Company's bridge over the Monongahela River at Port Perry, Pa. To avoid interference with traffic, it was necessary to erect Span 3 and 4 on the downstream side of the old spans, and, when they were completed, to roll the old spans out onto pier extensions on the upstream side of the bridge. New spans were then rolled into their final position. Span 3 weighed 1140 tons; span 4, 1850 tons."

"The steel was erected by a 60-ton locomotive crane which was moved out onto the falsework and traveled on the new span during erection. Operating it on the old spans would have blocked traffic."

"With the locomotive crane on the falsework, the erection panel loads became so great that in span 3, 12 wood piles per panel point or 72 piles for the span would have been necessary. Span 4 would have required 144 wood piles. By using CBP Sections it was possible to carry span 3 on 4 piles per panel point—a total of 24 piles. Span 4 was carried on 36 piles — even though loads per pile amounted to 75 tons."

"We found that the chief advantage of this type of falsework is that it can carry very heavy loads without longitudinal bracing except at the top of the falsework. This arrangement offers less obstruction to the current and aids the passage of driftwood through falsework. This falsework, only partly erected at the time, went through the March flood without damage."

For reports of other interesting installations of CBP Sections, write for our new bearing pile book.



In the design of the pier extensions for the new spans, wood falsework was eliminated because it would have necessitated too much falsework for the space available. By using USS Steel Bearing Piles one pier extension was made of 8 piles and the other two of 10 piles each. Says the engineer: "CBP sections were driven through 35 ft. of sand and gravel to a bearing on rock and would easily have supported 100 tons had they been braced to reduce the l/r."

USS STEEL BEARING PILES

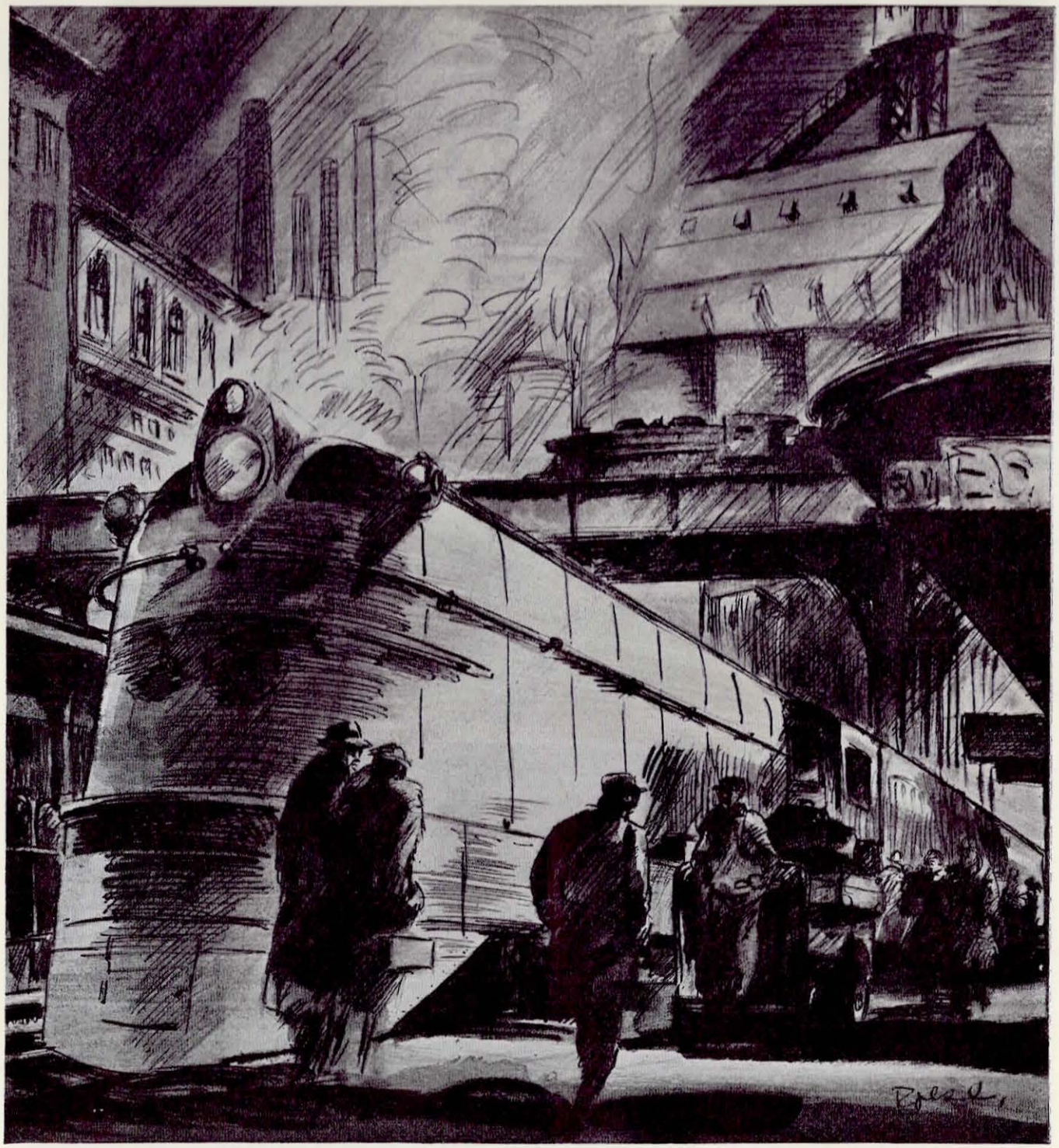
CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh — *Chicago*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Products Company, New York, *Export Distributor*

UNITED STATES STEEL



Arrival of the Limited

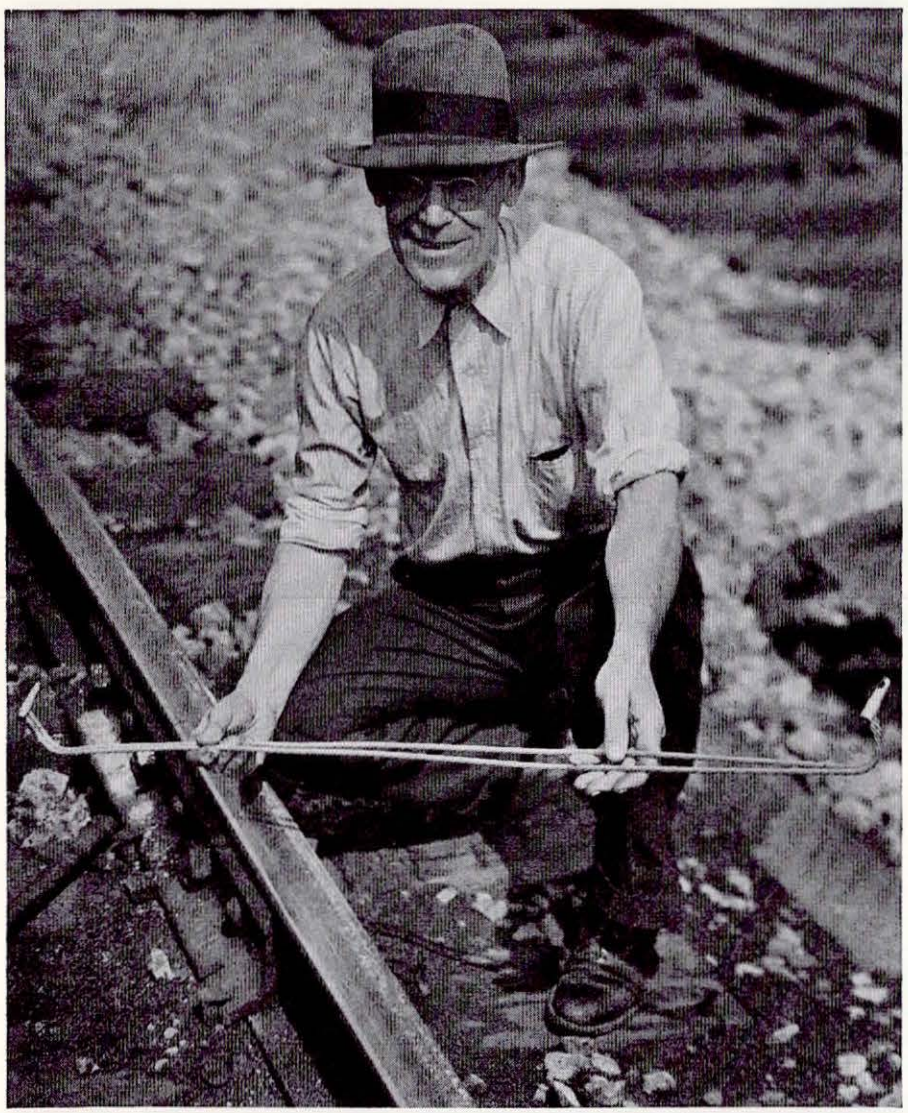
PAINT—AN EVIDENCE OF EFFICIENT RAILWAY MANAGEMENT

FOR THE special service and maintenance requirements of railway equipment and structures, it will pay to use these "Field-Tested" Pittsburgh Paints: CARHIDE — a revolutionary finishing system for freight, gondola, tank and refrigerator cars. CEMENTHIDE — a high-grade water-proofing system for concrete, cement, brick, stucco and stone. IRONHIDE — an unsurpassed rust protective system for steel bridges and other metal surfaces. STATIONHIDE — "Controlled Penetration" Paint for protecting wood surfaces.

• *An enlarged copy of the above illustration, suitable for framing, may be had by writing to Pittsburgh Plate Glass Co., Paint Div., Pittsburgh, Pa.*

Paint • PITTSBURGH • Glass
PLATE GLASS COMPANY

"I installed the first one on this road *Fourteen Years ago!*"



ASK any of the men responsible for your signal system why USS TIGERWELD Plug Type Signal Bonds are the most popular on the market . . . why for 14 years hundreds of thousands have been sold every year . . . why so many Class 1 roads standardize on them exclusively, use nothing else. The answer is always the same, "*Because they're dependable.*"

Their special fitness for the work they must perform is not just a happy accident. The TIGERWELD Signal Bonds illustrated here insure continuity of circuit, safe and uninterrupted signal operation because they are built for strenuous duty.

Type S-1 is composed of six extra-galvanized steel wires surrounding one copper wire . . . *Type DS-1* has two conductors of similar construction, thus doubly insuring the bond against failure . . . conductors are flash butt-welded to the husky solid steel terminals — construction features that make them far more resistant to vibratory stresses than any other type.

Their first installed cost is lower too. For installation is fast, simple and safe — requires no skilled labor, or cumbersome equipment. A three-pound hammer and a high-speed power drill or hand drill are all that are needed. They're easier and more economical to maintain too. Find out about USS TIGERWELD Signal Bonds, write for full details, samples and prices.

USS TIGERWELD SIGNAL BONDS

Flash Butt-Welded . . . Plug Type (PATENTED)

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

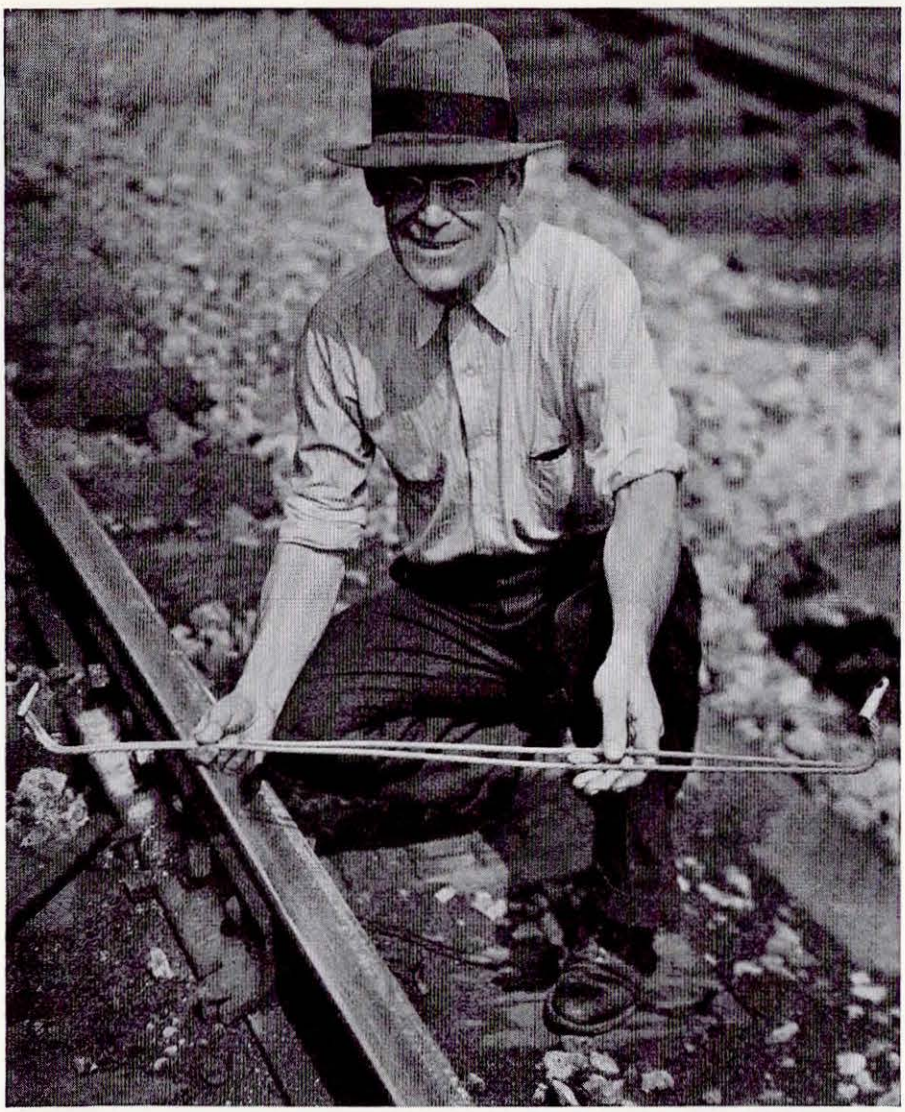
Empire State Building, New York

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

YOUNGSTOWN
RAILROAD
YOUNGSTOWN
MATERIAL
ALWAYS
UNIFORM
Because of an intensive production-control perfected by Youngstown metallurgists and inspectors, Youngstown customers are assured unfailing uniformity in the materials they receive.
Even when deliveries are made months apart there is no variation in quality.
THE YOUNGSTOWN SHEET AND TUBE COMPANY
Manufacturers of Carbon and Alloy Steels
General Offices - YOUNGSTOWN, OHIO
YOUNGSTOWN
TIE PLATES
SPIKES
SHEETS
PLATES
SHAPES
BARS
ROOFING & SIDING
SHEETS
PIPE
ELECTRIC CONDUIT
WIRE
BARBED WIRE
FORGED STEEL UNIONS
SEMI FINISHED STEEL
ALLOY STEELS
YOLOY
653
618

"I installed the first one on this road *Fourteen Years ago!*"



ASK any of the men responsible for your signal system why USS TIGERWELD Plug Type Signal Bonds are the most popular on the market . . . why for 14 years hundreds of thousands have been sold every year . . . why so many Class 1 roads standardize on them exclusively, use nothing else. The answer is always the same, "*Because they're dependable.*"

Their special fitness for the work they must perform is not just a happy accident. The TIGERWELD Signal Bonds illustrated here insure continuity of circuit, safe and uninterrupted signal operation because they are built for strenuous duty.

Type S-I is composed of six extra-galvanized steel wires surrounding one copper wire . . . *Type DS-I* has two conductors of similar construction, thus doubly insuring the bond against failure . . . conductors are flash butt-welded to the husky solid steel terminals — construction features that make them far more resistant to vibratory stresses than any other type.

Their first installed cost is lower too. For installation is fast, simple and safe — requires no skilled labor, or cumbersome equipment. A three-pound hammer and a high-speed power drill or hand drill are all that are needed. They're easier and more economical to maintain too. Find out about USS TIGERWELD Signal Bonds, write for full details, samples and prices.

USS TIGERWELD SIGNAL BONDS

Flash Butt-Welded . . . Plug Type (PATENTED)

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago — Empire State Building, New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

A POOR IMPRESSION ON PASSENGERS . . . AND POOR ECONOMY FOR ANY ROAD . . .

These sidewalls could be painted, but there is another way . . . more attractive and far more economical

How Much Better . . . These Imperishable, FIREPROOF SIDEWALLS!

J-M Cedargrain Asbestos Shingles provide the beauty of wood plus the economy of a permanent, fireproof material that never needs paint for protection!

PLENTY of painting to do on railroad buildings all over the country . . . there's no denying that.

But, since the last time these buildings were painted, Johns-Manville has developed and perfected a sidewall material that now offers you a decidedly more economical and permanent answer to this ever-present maintenance problem.

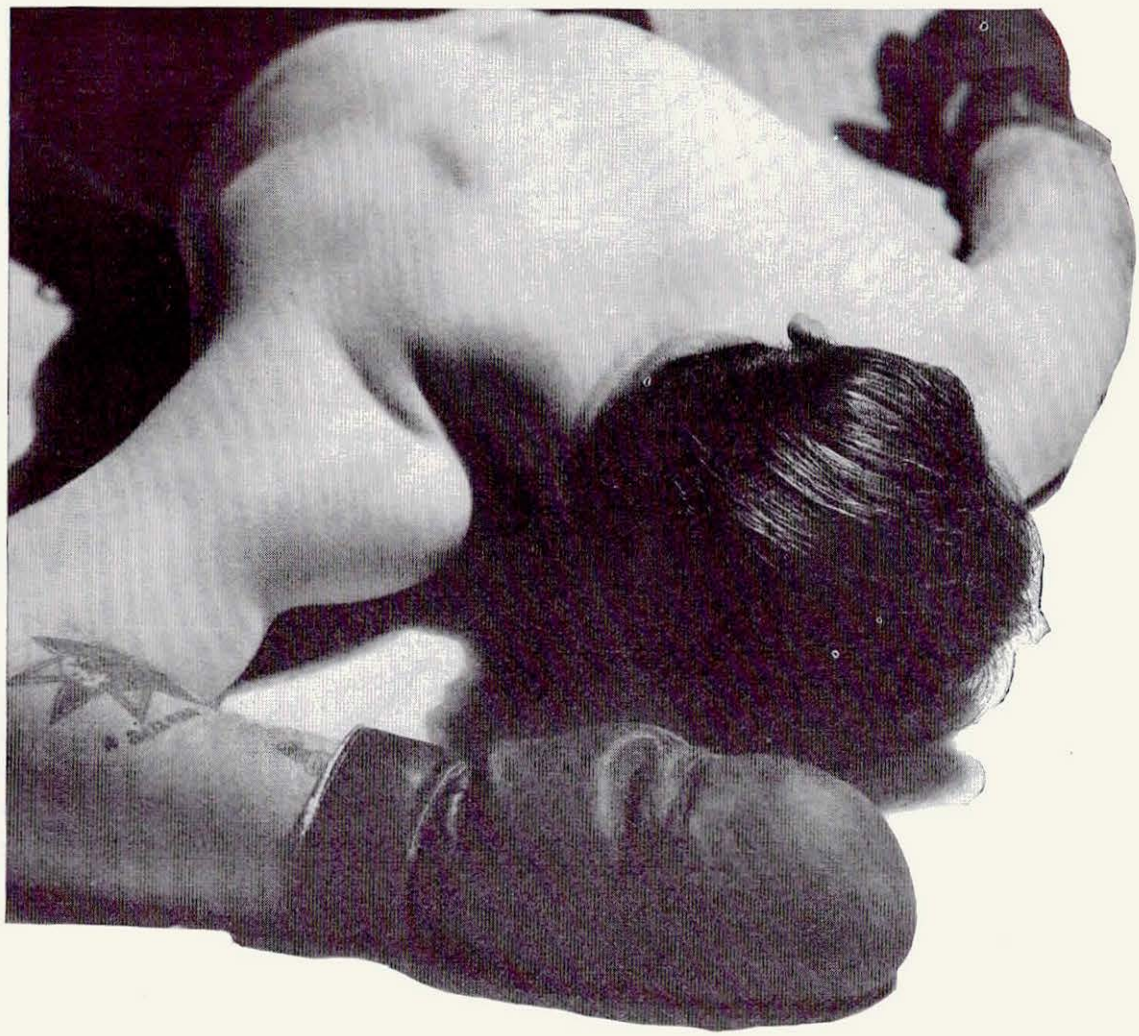
And that answer is J-M Cedargrain Asbestos Shingles. Reproducing the texture of fine wood shingles —yet permanent and incombustible because of their asbestos composition, these shingles provide your buildings with lasting protection against fire, weather and wear.

Cedargrains' well-kept appearance on signal towers, stations and other buildings speaks well for the road. They cannot split or rot, never need paint to protect their weatherproof surface! And the applied cost of these shingles is surprisingly low!

Why not get full details on J-M Cedargrain Asbestos Shingles—the latest product to carry forward Johns-Manville's 78-year record of service to transportation? For complete information on Cedargrains, address Johns-Manville, 22 East 40th Street, New York City.

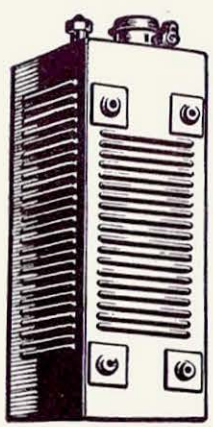
Johns-Manville SERVICE TO TRANSPORTATION

J-M MATERIALS CARRY ON A 78-YEAR SERVICE RECORD



SUDDEN FAILURE

....stops the performance



In the ring, sudden failure is part of the game. The knockout is hailed with mixed jeers and a bloody roar. But sudden failure is distinctly out of tune with 1936 railroading. The harm is deeper than momentary passenger-disgust when battery failure cuts out the air-conditioning and car lights wink and flicker. Unjustly, passengers take it as a reflection of the entire service. Who repays you for this loss of good will? Such damage cannot be repaid by an adjustment in the battery's purchase price.

In both principle and performance, the Edison Steel-Alkaline Battery is totally different from lead-acid batteries. Even more important than its 2 to 5 times longer life, the Edison is not subject to sudden failure. The Edison is the one commercial battery in which sudden failure is practically unheard of. It is the battery which frequently outlives its guarantee.

EDISON Storage BATTERY

DIVISION OF THOMAS A. EDISON, INC., WEST ORANGE, NEW JERSEY

YOUNGSTOWN
RAILROAD
YOUNGSTOWN
MATERIAL
ALWAYS
UNIFORM
Because of an intensive production-control perfected by Youngstown metallurgists and inspectors, Youngstown customers are assured unfailing uniformity in the materials they receive.
Even when deliveries are made months apart there is no variation in quality.
THE YOUNGSTOWN SHEET AND TUBE COMPANY
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TIE PLATES SPIKES SHEETS
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PIPE ELECTRIC CONDUIT
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FORGED STEEL UNIONS
SEMI FINISHED STEEL
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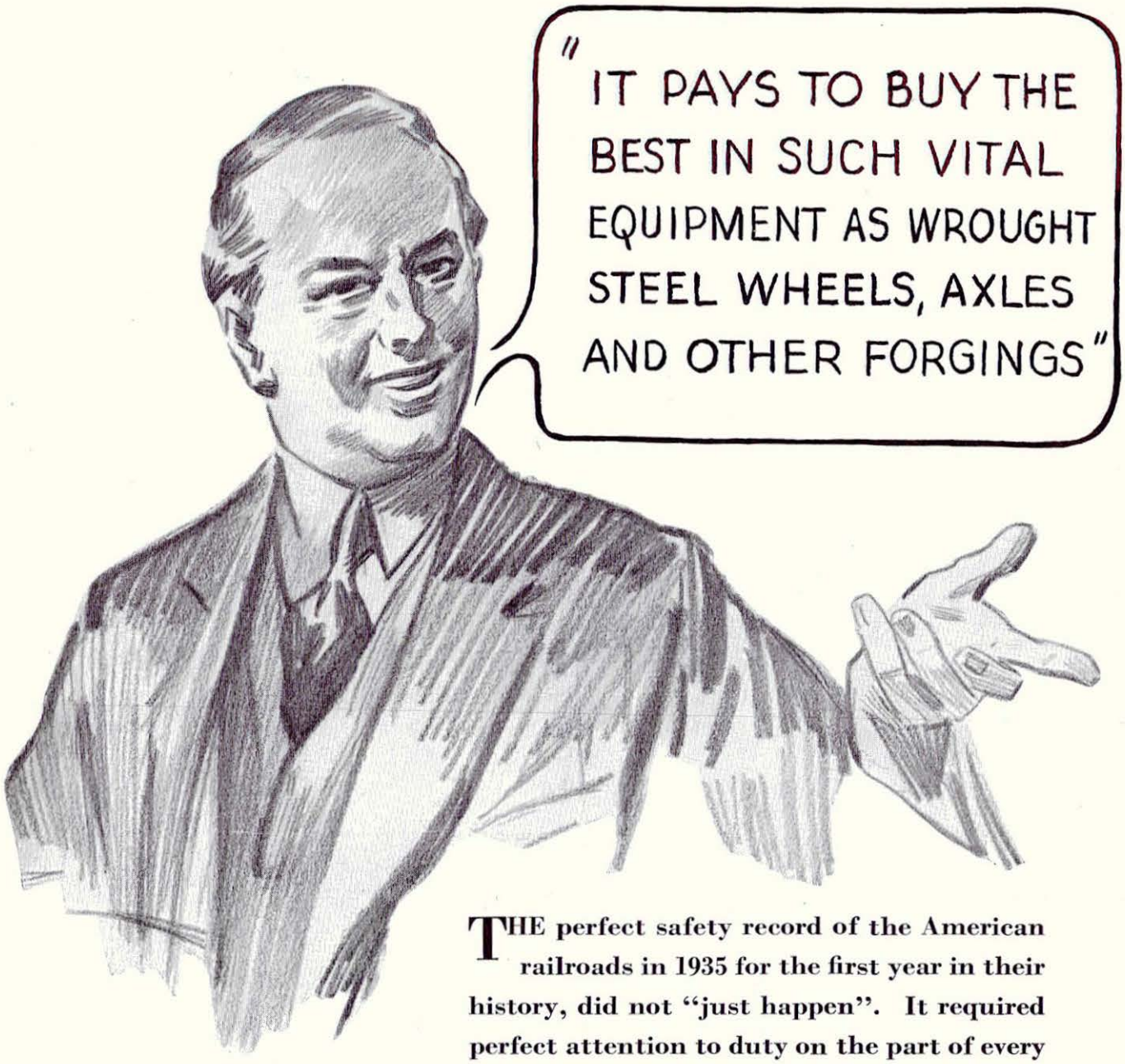
YOLOY
653
618



THE perfect safety record of the American railroads in 1935 for the first year in their history, did not "just happen". It required perfect attention to duty on the part of every man on every road. It also required a careful selection of the best equipment available. We are proud that our wheels, axles and forgings stood up to our own expectations and our promises and did their share. They will continue to do their share for years to come.

STANDARD STEEL WORKS COMPANY

SUBSIDIARY OF THE BALDWIN LOCOMOTIVE WORKS

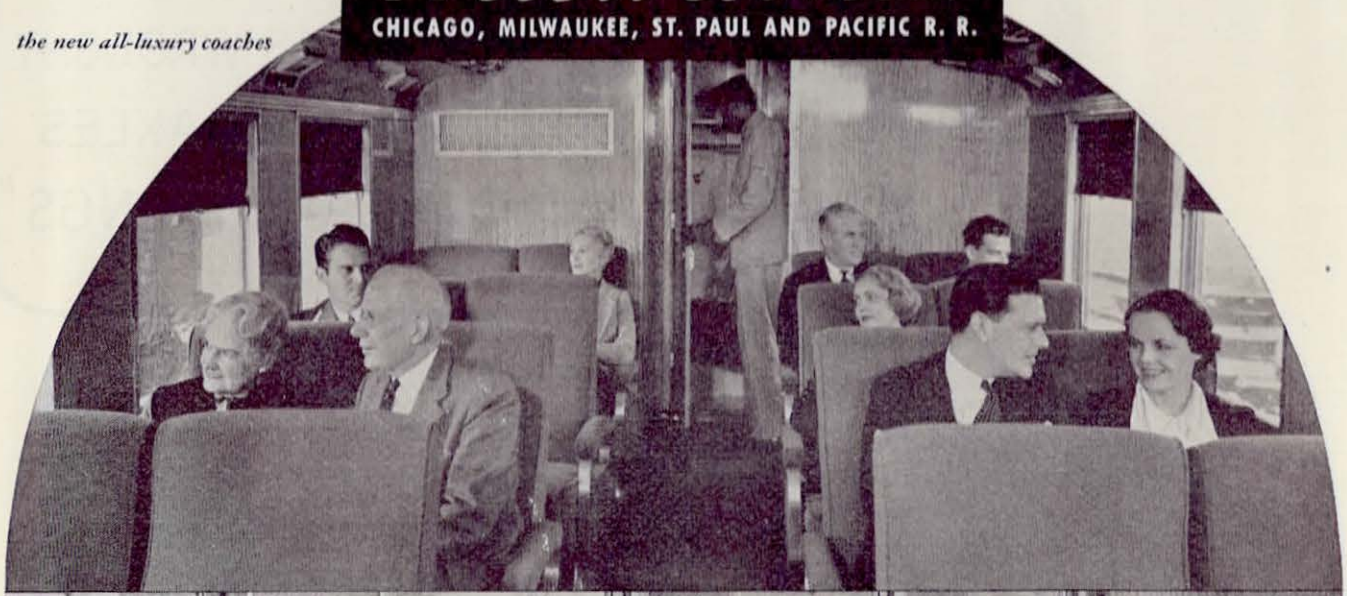
GENERAL OFFICES & WORKS: BURNHAM, PA.

NEW YORK PHILADELPHIA CHICAGO ST. LOUIS SAN FRANCISCO PORTLAND

The new 1937 "Hiawatha"

CHICAGO, MILWAUKEE, ST. PAUL AND PACIFIC R. R.

the new all-luxury coaches



the new parlor cars

They ride at ease on

VELMO

MOHAIR VELVET

Its beauty and comfort "belong" in these modern cars . . . its well-proven staunchness makes it a wise investment!

A GOODALL-SANFORD PRODUCT

L. C. CHASE & COMPANY, INC.
selling division of Goodall-Sanford
295 Fifth Avenue, New York
Boston • Chicago • Detroit • San Francisco

WARNING

. . . PLUS PROTECTION

● Installation of this AUTO-STOP on the Boston and Maine at Wayland, Massachusetts marks one more step in the inevitable march toward real crossing protection.

Month by month and year by year public acceptance of the AUTO-STOP is making itself felt. Even careful drivers see the wisdom of positive protection. Faster automobiles, speedier, lighter trains combine to increase the crossing hazard.

The railroads recognize the need for something more than just a warning. The lives of their own passengers, as well as the safety of motorists, are at stake.

And highway officials are substituting the AUTO-STOP for proposed separations in many places because of its protective features and low cost. Twenty AUTO-STOPS can be installed for the cost of one average grade separation.

In short—the AUTO-STOP is "in".

In addition to being the best possible warning, the AUTO-STOP demands the respect of drivers who will not heed any ordinary warning. It demands respect because of its ability to STOP the driver forcibly, but without personal injury, if he chooses to race with death.

EVANS AUTO Stop

DIVISION OF

EVANS PRODUCTS CO., Union Guardian Building, Detroit, Michigan

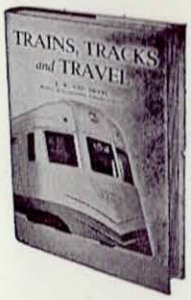
Valuable Books for Your Library

New Fourth Edition

Trains, Tracks and Travel

By T. W. VAN METRE

Professor of Transportation, Columbia University



The new edition of this popular book on railroads describes latest practice. There is a complete new chapter on streamlined trains and additions to others covering the new developments in air brakes, air conditioning of passenger cars and in high-speed Diesel and electric locomotives. Among the numerous new illustrations are shown the new streamlined trains. This is an excellent book for a boy who wants to know more about railroads and for the average reader.

Contents

Our Steam Railroads—The Railroad Track—The Steam Locomotive—Electric Locomotives; Gasoline and Oil Motors—Freight Cars—Passenger Train Cars—Tomorrow's Trains Become Today's—Passenger Stations and Terminals—The Operation of Trains.

1936. 4th. 312 pages, 276 illus., 7 x 9½ in., cloth, $3.00

Analysis of Railroad Operations

By J. L. WHITE

Formerly Assistant Comptroller, United States Railroad Administration; Director, Section of Transportation Service—Federal Co-ordinator of Transportation

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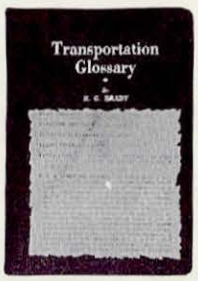

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Vol. 101 November 14, 1936 No. 20

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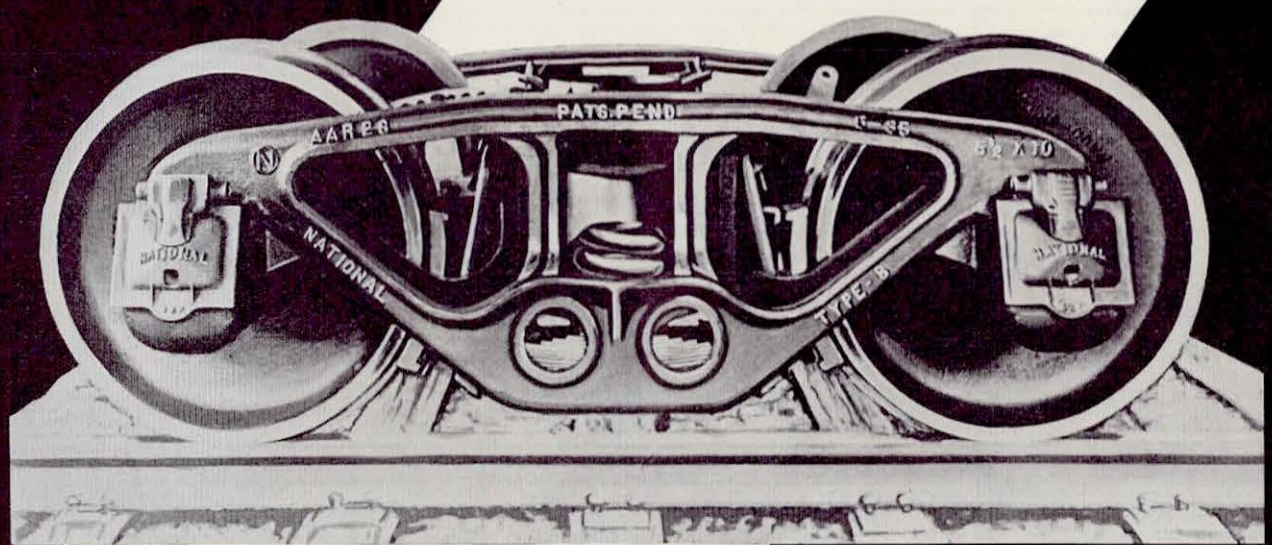

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NATIONAL *TYPE B* SPRING PLANKLESS TRUCKS

The Week at a Glance

C. P. R. STREAMLINERS: Four handsome, brand new, streamline trains, of four cars each, drawn by "Jubilee" type 4-4-4 locomotives, are the Canadian Pacific's contribution to modern, high-speed passenger service. These novel trains are described with illustrations in an article herein.

CARLOADINGS: The peak of carloadings—826 thousand—was reached in the October 17 week. Since that time the loadings—instead of dropping suddenly—have tapered off gradually. October 24 loadings totaled 816 thousand and the total eased off to 814 thousand in the October 31 week. The "peak" is a round one and not a sharp pinnacle—and that is the best shape for it to have, from a revenue standpoint.

C. AND D. DELAY?: The American Trucking Associations have asked the federal court in the District of Columbia to enjoin the I.C.C. to cancel the tariffs under which the Eastern railroads propose to institute free collection and delivery on November 16. The court has given the railroads and the I.C.C. until November 12 to show why the injunction should not be issued. Similar petitions have been entered at the federal court in New York by truckmen's organizations.

LOCO TESTING: Lawford H. Fry, engineer for the Edgewater Steel Company, points out in a short article that, despite 80 years of research, engineers are still in disagreement as to some of the fundamental principles of locomotive operation. Failure to agree, he contends, is not due to lack of experimental data—but to insufficient assimilation of it. Engineers ought to try to clarify their objectives as a preliminary to further study of the locomotive.

BRAKE RIGGING DOWN: The Lackawanna and the Pennsylvania, working independently, have developed and installed devices which give warning of brake or other car and locomotive appurtenances which have become loosened and are dragging below the tops of the rails. Notice of such failures is given by signal indication. These important safeguards against a common cause of accidents are described elsewhere in this issue.

DR. H. G. MOULTON: The distinguished head of the Brookings Institution—independent economic research foundation at Washington—was the speaker at the Railway Business Association dinner last week. Dr. Moulton's studies of transportation date back to 1912, when his exposure of the economic unsoundness of inland waterway development ("Waterways vs. Railways") won for him the Hart, Schaffner & Marx prize and nation-wide recognition as a brilliant economic analyst. He is the author of scholarly works on a wide variety of subjects; has shown up the unsound and even fraudulent claims being put forward by proponents of the St. Lawrence Seaway; was research chief for the so-called "Coolidge Committee" which investigated transportation problems a few years ago.

MORE JOBS: George M. Harrison, chairman of the railway labor executives association, has announced the intention of the railway unions to endeavor to secure the enactment by Congress of a six-hour day law for railway employees—in order to make more jobs. This proposal is discussed editorially herein. The logic of Mr. Harrison's view appears to be: Since people won't buy railroad service at present costs in sufficient quantity to give jobs to all employees, then the remedy is to push the costs higher still. But how can railroaders expect to get more work at 6 hours a day while truck and barge employees are still working long hours at low wages, providing alternative methods of transport for bargain-seeking shippers? In order to make a shorter railroad workday "stick" would it not be necessary also to force the same limitation on all other transport agencies?

SHIPPERS PROTEST: Over 100 shippers and shippers' organizations have protested to the Interstate Commerce Commission the railroads' proposals to substitute a general readjustment of freight rates for the emergency increases which expire December 31. The National Coal Association and counsel for the Bituminous Coal Commission go farther: They want a general investigation of all bituminous rates.

PETTENGILL WINS: One election result in which all railroaders will take satisfaction was the re-election of Congressman Samuel Pettengill to the House from the Third district of Indiana. The victory of this valiant fighter for the repeal of the Fourth Section means, in all probability, that the bill in the new Congress calling for the removal of this handicap to the prosperity of the railways and their employees will once more be the "Pettengill bill."

RATES RUINING SOUTH?: David Lilienthal, director of TVA, addressing the Institute of Public Affairs, University of Georgia, recently said: "There are barriers to sound industrial development in the South. Some of them are artificial—made by man and removable by man. For example, the South is surrounded by a Chinese wall of freight rates that place it at a disadvantage in the marketing of its industrial products. It furnishes one reason (some would even say a justification) for the pressure on wage rates in Southern industry. And it has come to be recognized that low wages, which mean low purchasing power, is one of the most serious forms of the draining of wealth and income."

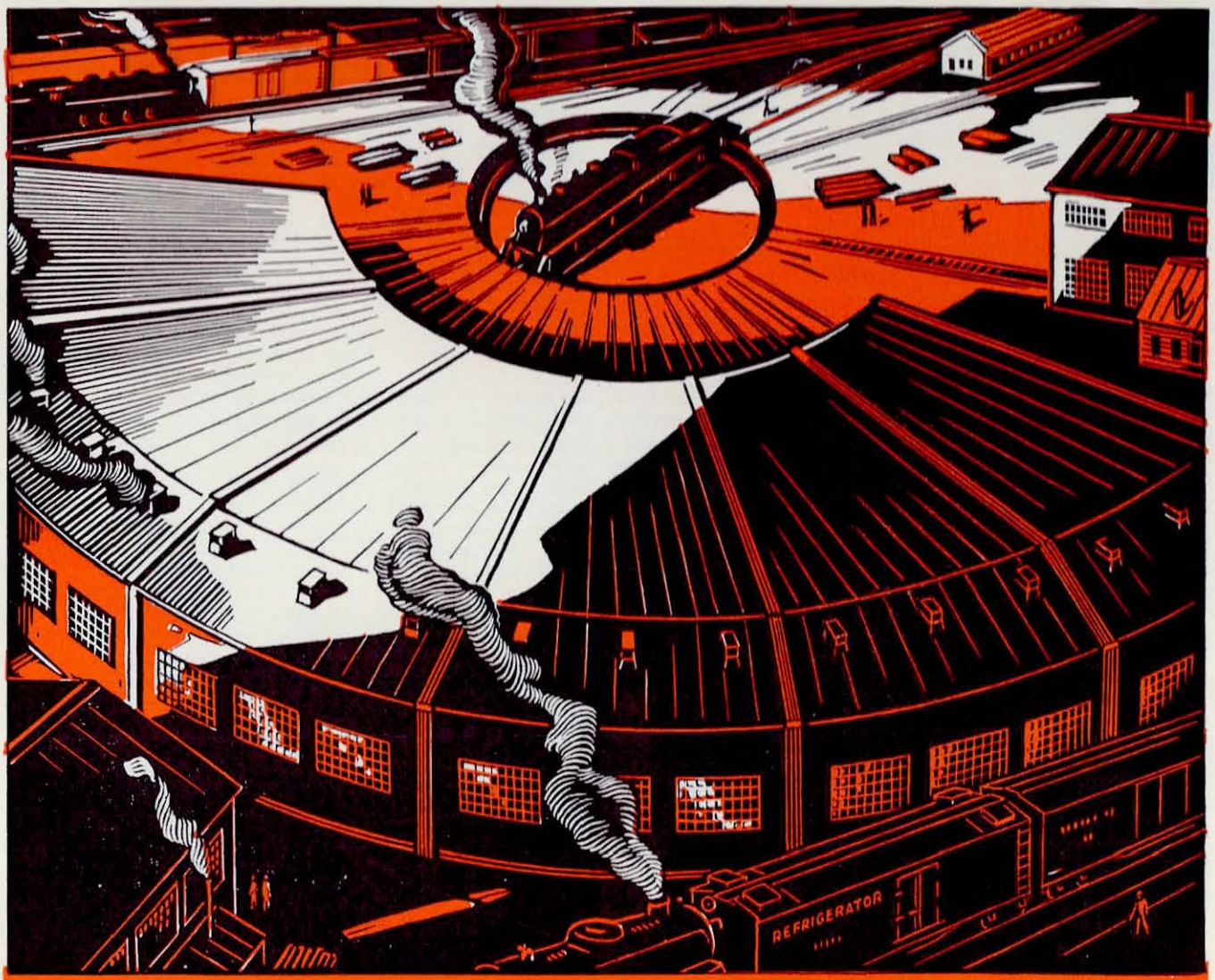
RAILROADS RADICAL?: This is the contention of W. Averell Harriman, chairman of the board of the Union Pacific, in an address to the New York Lions Club this week. May, 1933, was "a good season for political experiments but a tough one for industrial innovations." But that was when the Union Pacific turned "radical" and ordered its first streamlined train. Since then a "revolution" has taken place not only in the railways' accomplishments with their passenger service, but "a revolution in the attitude and interest of the public in our industry."

UNCLE SAM PROFITS: The Reconstruction Finance Corporation has sold at a profit of $184,960 an issue of $4,624,000 of Nickel Plate 4 per cent equipment trust certificates. The railroad got the par price for these certificates when it sold them to the government, but the R.F.C. has sold them under competitive bidding at a premium of 4 per cent above par. The R.F.C. is planning to clean up some more of this easy money—judging by the I.C.C. decisions which have been coming through authorizing railroads to waive the right of redemption on government-held railroad equipment issues, which they have to do before the R.F.C. can offer them to private investors.

CCC ON RAILROADS: In Canada the government's work relief camps, corresponding in many respects to the CCC camps in the U. S., were closed last spring and the employees were turned over to the railroads to perform maintenance and betterment work of a kind which regular budgets would not permit. This unusual project, which is described in detail in this issue, appears to have been satisfactory all around. (There was no competition with regular railroad employees, because the relief workers did work which the railroads otherwise would not have undertaken).

RESEARCH ZOOMS: A.A.R.'s report to member roads at their meeting in New York last week disclosed greatly intensified research activities. Air conditioning is under the microscope—with a view to improving it and promoting standardization. Better rails, rail joint welding, more efficient motive power, greater use of lighter materials in cars, draft gear improvements—these are but a few of a multitude of research projects under way by the industry whose enemies have made it out to be dead from the neck up in keeping apace with progress.

WHAT ROADS SPEND MOST?: In dollar volume, of course, it is the big trunk lines. But smaller Class I roads, and roads in bankruptcy, spend a large proportion of their operating revenues than do the larger and more properous carriers. An analysis of comparative expenditures is published in this issue.



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RAILWAY AGE

How Increase Railway Employment?

George M. Harrison, chairman of the Railway Labor Executives' Association, has recently announced the decision of that group to press for the passage of legislation limiting railway employees to six hours' of work per day, with no decrease in earnings. The purpose of this legislation, according to Mr. Harrison, is to increase employment in railway service. The *Railway Age* believes—and apparently Mr. Harrison would agree with us in this—that the most important of all the many problems of the railroads is that of getting furloughed employees back to work. But is the 6-hour day the method which is most likely to bring that result; or are there not other methods which might be used with far more likelihood of success?

Cheap-Labor Competition for Railroad Jobs

We believe that the question is of transcendent importance not only to the railway industry, but to the well-being of the great body of railway employees, and that the question ought to be debated with the utmost thoroughness and without prejudice. The railway industry is faced on every hand with competition which is subsidized out of the public treasury and which works its employees much longer hours for wages which are but a fraction of those paid by the railways. These subsidies and low hourly wages enable these competitors to charge lower rates than they would otherwise be able to charge, and hence to take traffic away from the railroads, depriving railway employees of their jobs. This statement is not one of mere opinion but is demonstrable from facts known in every community in the country, and Mr. Harrison gave expression to a similar observation in his testimony in behalf of the motor carrier bill last year. He said:

"The railway employees, through their labor unions, have been able to establish reasonable, decent wages and working conditions of their industry; they have been responsible for the approved standard of life and living of probably 3,000,000 of our citizens. We believe that those standards are being threatened and will be subject to attack, unless our competitors are required to keep substantially those same principles of decent standards of wages and working conditions for the employees of those industries, and put them on a fair basis of competition."

Well, there isn't any 6-hour day in truck service, or even an 8-hour day. The trucks are still getting the use of the highways at a fraction of a reasonable assessment for the privilege. The government is busily digging out the rivers to make barge operation more economical. In the face of such competition, how can anyone logically conclude that the way to increase railway employment is to increase railway wage costs by 33⅓ per cent—which is what a reduction from 8 to 6 hours without a decrease in pay means?

An Example from the Printing Trade

We have seen competition of high-priced labor with cheaper labor work out in the printing business in New York. Formerly New York was a great printing center. It was practically 100 per cent organized, and then the union started piling on burdensome working rules, reducing hours, boosting up wage rates and otherwise subjecting printing in New York to labor costs which were far above those of neighboring communities. The employers had no alternative but to pass these extra charges on to their customers, and the customers soon found that they could get their work done more cheaply elsewhere, and they moved. Plant after plant long and honorably known in the printing trade went out of business. And the employees, after long periods of idleness, have had to go into other work or move elsewhere to secure employment at their trade. When they have done the latter, they have had, of course, to accept the lower standards obtaining in the communities to which they moved. It is safe to say that the job printers now working in New York are only a fraction of the number employed before the union made its drive to push wage standards there to a considerably higher level than elsewhere.

The effort to make more jobs by shortening hours of labor, and otherwise increasing its costs, brought about the very opposite result because of competition in the printing industry, to which these increased costs were not applied. Since the transportation industry is also competitive and since railway employment has al-

ready suffered, as Mr. Harrison himself recognizes, by reason of the differential between railway wages and working conditions and those of competing transportation—how can one escape the conclusion that a further increase in the railways' wage cost handicap would prove an obstacle, rather than a help, to re-employment by the railways? If Mr. Harrison were proposing to establish the 6-hour day in all forms of transportation, then it is conceivable that the goal of greater employment might be achieved (although that is debatable). But a bill to establish the 6-hour day on the railways alone ought to bear the title "An Act to Increase Employment in Truck and Barge Transportation," because that would be its inevitable consequence.

Higher Pay and Fewer Jobs—an Impartial Opinion

As Professor Sidney L. Miller has said, in his "Inland Transportation": "In the face of price competition that grows increasingly keen it appears that, *until rival agencies are burdened with total service costs and certain other restrictions are imposed in the interest of public safety and social policy, railway workers must choose between a small volume of employment at high wage rates and a greater volume at lesser rates*—which may yield a larger annual income per worker, though is not certain so to do."

In contrast to the very grave possibility that the 6-hour day for the railroads alone would have the very opposite effect of increasing railway employment—and it could not fail to have a restricting effect in the long run—there are other measures which the railway labor organizations have heretofore supported and which they have recognized would unquestionably increase railway employment. Two such measures are the Pettengill bill to repeal the Fourth Section (long-and-short-haul clause) of the Interstate Commerce Act and the water carriers regulatory bill. But these are not all by any means. The labor organizations with their great political power could undoubtedly do a great deal to discourage excessive expenditures on highways and waterways. In some of the state legislatures the labor organizations have done a wonderful job in helping to get on the statute books legislation restricting the weight of trucks to reasonable limits, in limiting the hours of labor of drivers and in subjecting these operations to reasonable fees for the use of the highways. If the legislation of this character which the labor organizations have helped to bring about in a few states could be secured in all, it is safe to say that many a discontinued train would be restored to service and many jobs would open up in shops, in yards and in offices. And many a railroad line now headed for abandonment could be retained in operation.

Moreover, every railroad man knows of situations right on his own railroad where any sudden increase in costs would make abandonment unavoidable—many branch lines would have to go, many agency stations now barely paying their keep would have to be closed, freight and passenger trains now just paying their way would have to be pulled off, small shops and terminals here and there all over the country would have to shut down. Certainly a lot of places with switch engine service would have to have it withdrawn. These facilities closed down would inevitably mean less main line traffic and hence less clerical, maintenance, yard, and freight house work. Quite likely the railroads, with such loss of traffic could get along under a 6-hour day without in the long run adding any employees anywhere—and certainly there is no chance that they would make enough new jobs to offset those they would have to lay off because an increase of 33⅓ per cent in hourly wage rates would put so many operations deeply "in the red."

Actual Improvement vs. a Paper Victory

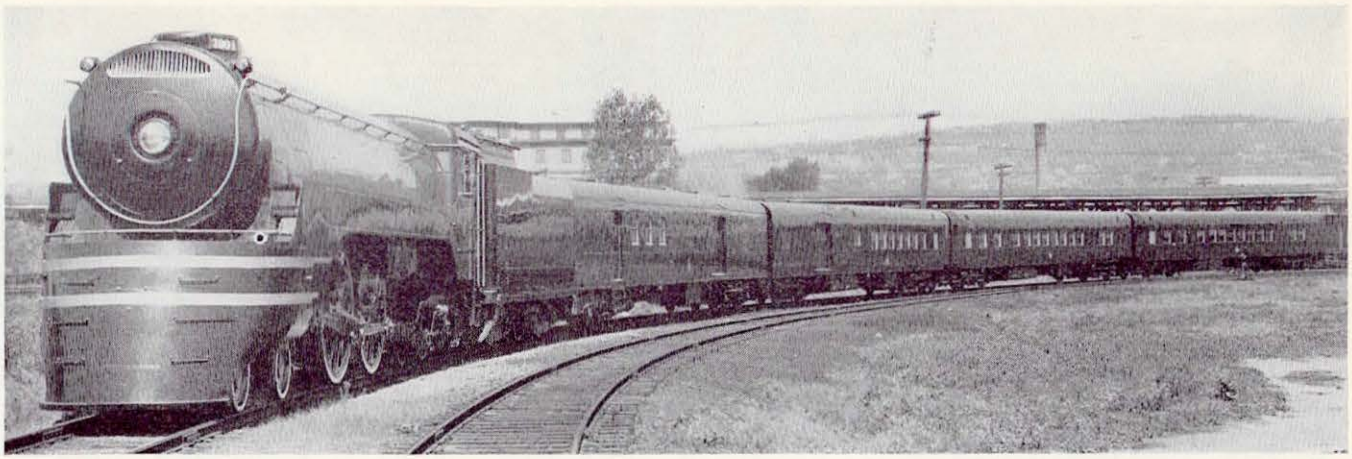
The function of a labor organization is to improve the economic status of its members, and if the 6-hour day is the best means of improving the economic position of railway employees, then the railway labor executives clear duty would be to support it (provided no higher considerations of public welfare impeded them). In our opinion—and we believe the labor executives would agree—the matter of re-employment of furloughed workers is the sore spot of the economic situation of railway labor which most deserves their attention (as it does also that of railway management). Beyond that, the next most important problem is to discover, if they exist, means of safeguarding in future against the recurrence of any such wholesale reduction in employment and traffic as has occurred during this depression. Only when these questions have been tackled and brought, if possible, to at least a partial solution is there any justification in the employees' own interest for annexing a large part of the limited funds in railway treasuries for increases in hourly pay rates.

Railway wage rates compare favorably with those of other industries. The big difficulty is that there are not enough men on the payroll and the position of those on it is not sufficiently secure. First things ought to come first. And greater security of railway employment—now constantly threatened by subsidized competition—certainly is of more importance than more leisure and higher hourly pay for the relatively few employees whose seniority position assures them a place on the payroll, even when traffic severely declines. When railway labor sets out to use its political power to improve its economic position, it cannot afford to disregard the subsidized, cheap-labor competition which is ready to take over even more railroad work, and even more railroad jobs, the minute railroad costs are forced upward.

The Week at a Glance

A New Feature

See page 19 in the Advertising Section



C.P.R. Inaugurates High-Speed Local Passenger Service

Light-weight air-conditioned cars are designed for service with 4-4-4 type streamline steam locomotives

THE Canadian Pacific has recently completed 16 light-weight passenger-train cars for use in high-speed local passenger service. The cars are of entirely new design and depart materially from the standard contours of former Canadian Pacific passenger equipment.

The lot is made up of three types. There are four combination mail and express cars, weighing 107,700 lb. each; four combination baggage and buffet coaches, weighing 114,000 lb. each, and eight first-class coaches with large men's and women's lounges, each of which weighs 110,000 lb. The equipment is available for four trains which will be hauled by the new high-speed streamline 4-4-4 locomotives delivered to the railroad by the Montreal Locomotive Works during the past summer.

Following completion the new trains were taken on exhibition tours, amounting to a total of 7,500 miles, and during that time were visited by more than half a million people. Upon completion of the tours the trains were put in revenue service on experimental schedules and on September 27 were put on their regular runs, in each instance in relatively fast local service with a large number of stops.

Two trains have been assigned to the Montreal-Quebec service which involves a 4½-hr. schedule for the 173-mile run in each direction, including 32 intermediate stops. One train, with two locomotives, has been assigned to the Toronto-Detroit run. This train has been christened "The Royal York," and will make the round trip between Detroit and Toronto daily, making the 229-mile one-way run in 5 hr. 35 min., both eastbound and westbound, with 19 intermediate stops in each direction. The fourth train, name "Chinook," will run between Calgary and Edmonton, making a round trip daily and completing the 194-mile run in 5 hr. 15 min., with 22 intermediate stops in each direction.

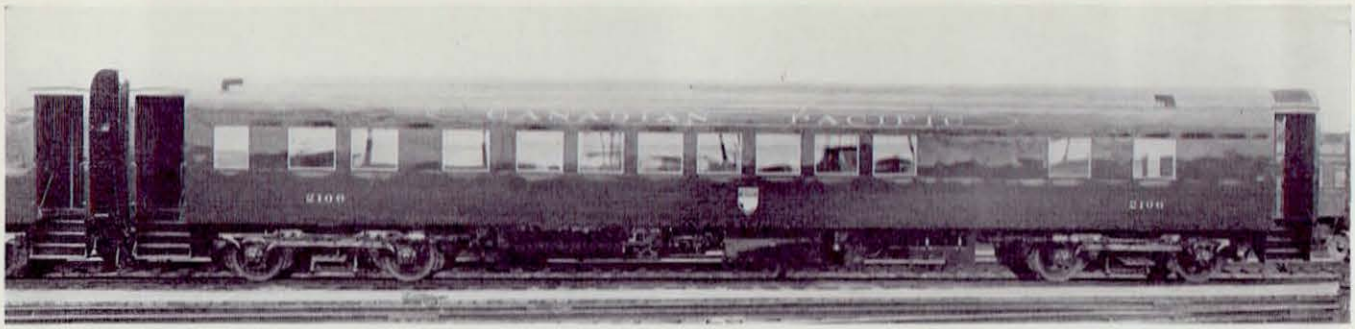
The new equipment was designed by the mechanical department of the railroad. The frames of the cars were built by the National Steel Car Company, Hamilton, Ont., and finished at the Angus shops of the Canadian Pacific at Montreal. One of the principal objectives in the design was to reduce weight. This has been done, however, by refinements in the distribution of material rather than by the employment of special alloy structural steels.

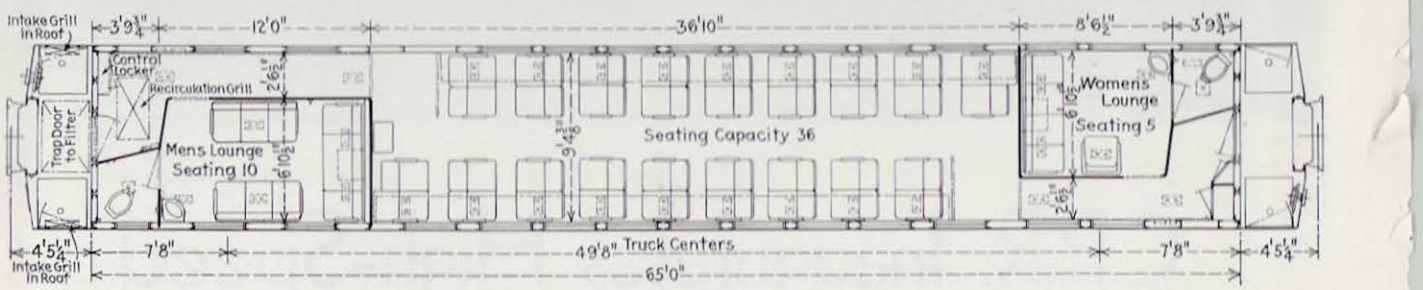
The ornamentation of the interior of the cars is relatively simple. Aside from the center distribution air duct, which extends longitudinally below the flat ceiling and breaks up its continuity, and the special aluminum basket racks, it is confined to striping between the ceiling and the side and end walls, above and below the curtain moldings over the windows and at the window-sill line.

The ceilings on both the buffet and the first-class passenger coaches are finished in light cream. The pier sections and end walls of the coach are finished in a darker cream at the top, shading down to drab at the wainscoting, which is brown. The floor is covered with marbleized brown linoleum with the aisle strip outlined by black stripes. The striping between ceiling and wall colors, over the windows and between the walls and wainscoting colors is in dark brown. The basket racks are finished in the wall color, relieved on the edges and on the brackets by black striping. The buffet coach is similarly finished, except that the walls shade down to green on the wainscoting and the floor is covered with green marbleized linoleum. The roller window shades in the coach are faced in brown; those in the buffet coach, in a green tone.

The first-class coaches are furnished with Heywood-Wakefield rotating type double seats of tubular stainless-steel frame construction, with individual reclining adjustment. Those in the buffet coach are similar, except that the backs are non-reclining. All are upholstered with Chase friezette in a checked pattern—tobacco brown in the first-class coach and green in the buffet car.

In each first-class coach is a men's lounge with a seating capacity of ten, and a women's lounge which has seats for five persons. The sofa seats in both lounges





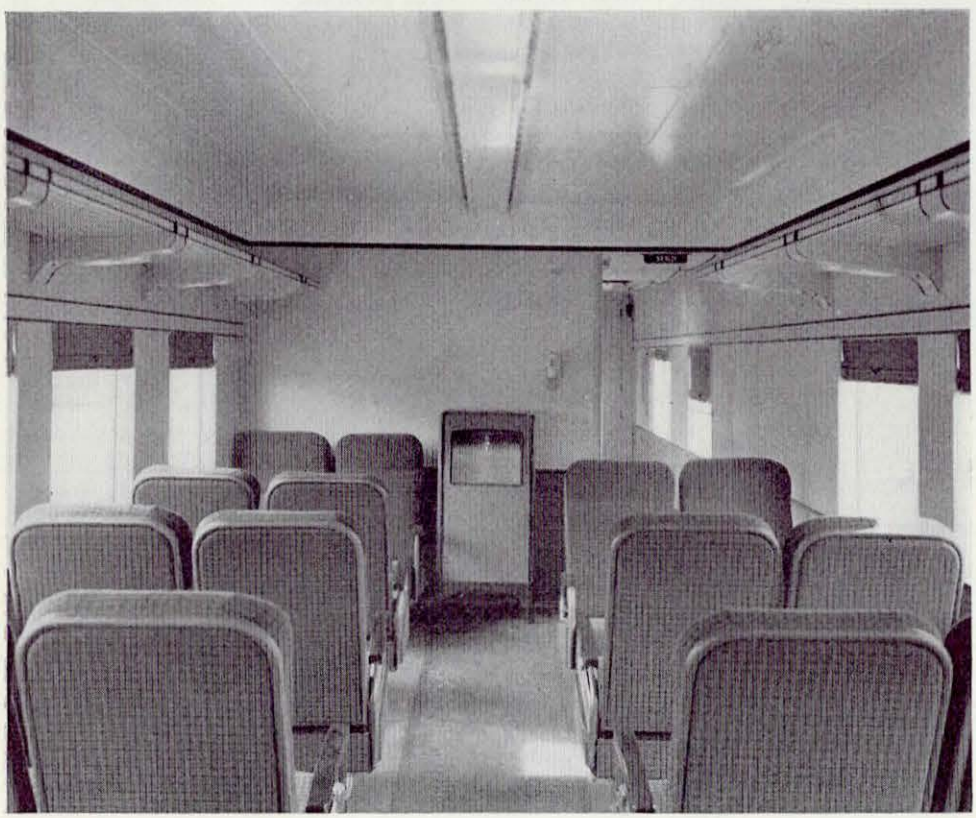
A First-Class Coach

have the same angle as the seats in the coach section. Those in the men's room are in brown leather upholstery, while those in the women's room are upholstered in the same material which is used on the seats in the main room of the car. Men's and women's toilets are located in the end of each buffet coach.

With the exception of space for a side aisle, the buffet occupies 7 ft. 6 in. across the front end of the passenger compartment in the combination baggage and buffet coaches. It is equipped to serve light meals and refreshments and also provides news-stand service. Meals or refreshments can be served at the counter or at four double tables arranged between the first two pairs of seats on each side of the aisle.

The exteriors of the coaches are finished in Tuscan red, the standard Canadian Pacific coach color. The roof is in black and the name of the road is lettered in gold on a black letter-board panel which is also outlined in gold. The trucks and under body are painted black and black stripes are applied under the windows and at the bottom of the sides.

Thirty-volt lamps are used for train lighting to insure that lamps will burn at full rated candle power from the battery when the generator is not working. With a few exceptions, the cars are lighted entirely by Safety prismatic glass fixtures placed on the underside of the baggage racks. Each fixture is equipped with two 25-watt lamps controlled by a toggle switch on each unit. This type of unit will distribute the light so that the intensity is only slightly greater over the aisle seat than over the



The Interior of One of the First-Class Coaches

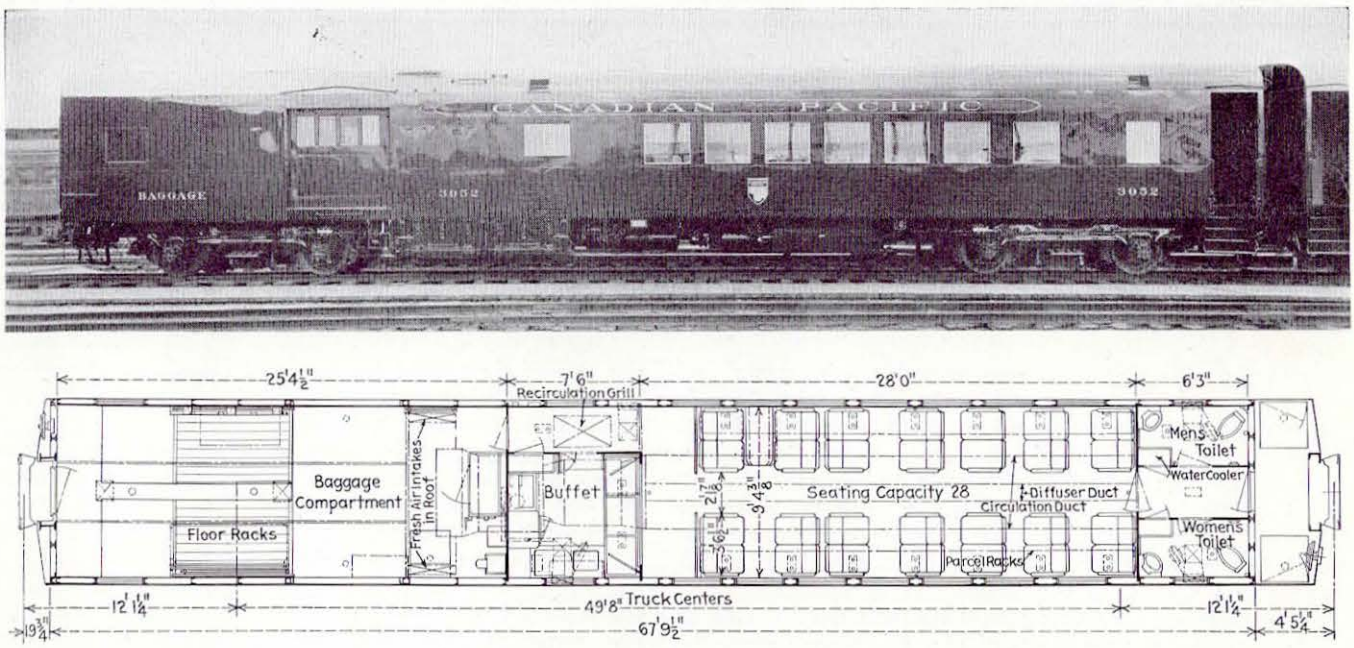
Light Meals are Served in the Combination Baggage-Buffet Coaches

window seat, and is designed to provide an intensity of 12 foot-candles on the 45-deg. reading plane. Similar fixtures are used in the passageways and smoking rooms, but these fixtures are not individually controlled.

Single 25-watt Safety lighting fixtures are used in the toilets. There are also 25-watt lamps in the equipment lockers and over doors and desks in the mail and baggage compartments. General illumination in the mail and baggage compartments is provided by 75-watt lamps in RLM type enameled-metal fixtures.

The combination baggage and buffet coaches and the first-class coaches are all equipped with ice-activated air-conditioning systems. Both the re-circulated and outside air brought into the cars is passed through a series of water sprays. A thermostatically controlled motor-operated by-pass valve delivers water from the ice box or the sump to the sprays, depending on the amount of cooling required.

A motorized damper energized through the panel setting varies the amount of fresh air, giving 25 per cent on cooling and heating and 100 per cent on ventilation only. A large dial thermometer in the air-conditioning



The Combination Baggage-Buffet Coach

control locker shows outside temperature and indicates to the trainman which of three settings—high, low and medium—is to be selected to produce best air-conditioning results.

The cars are heated by the Vapor system under thermostatic control which is interlocked with the air-conditioning control. Floor heat is obtained from fin-tube radiators at the usual location and is supplemented by top heat which is distributed through the air-conditioning ducts.

The Body Structure

In the design of these cars the railroad has adopted a roof of oval section without clerestory and relatively flat across the top. This has been worked out on a basis to permit its universal use for new equipment, sleeping cars as well as coaches.

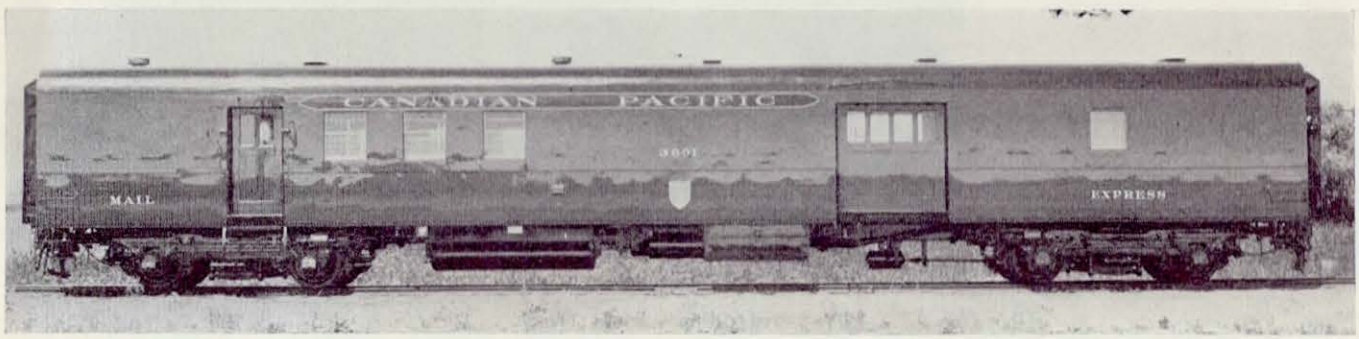
The body structure departs materially from the customary side and roof units in which the side-plate forms the top chord member of the side frame and the base for the attachment of the roof structure. The side posts, which are of channel section pressed from ⅛-in. steel, continue well upward into the roof curve where they are fitted into 4-in., 5.4-lb. channel longitudinal members. The carlines, which extend across the car in one piece to complete the roof frame, are likewise framed and welded to channels of the same section, and the two channels at each side are riveted together, back to back. Longitudinals are fitted and welded between the carlines, one on each side about 2 ft. from the center line.

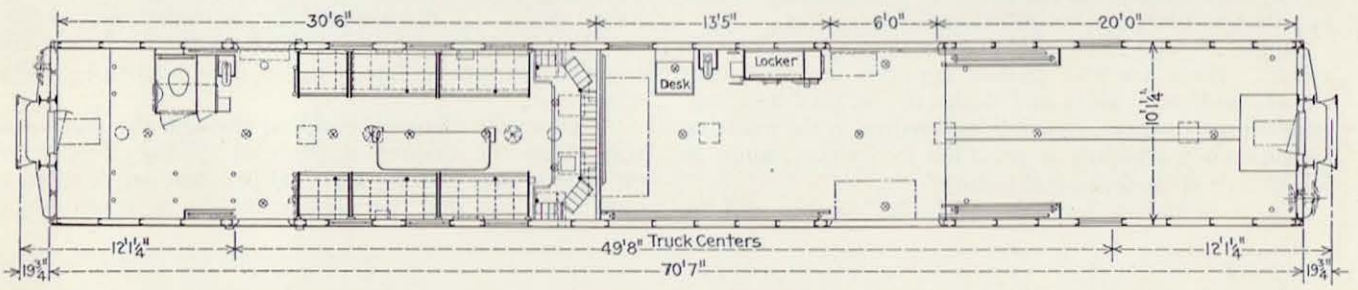
Window-sill pressings are welded to the posts and where the outside pier-panel cover plates join the side sheathing at the window-sill level and the letter-board sheathing above the windows there is a 2-in. by 1½-in. by ⅛-in. angle welded to the posts and sheets.

Extending from the top of the letter board over the sharper portion of the curve of the roof to a point 3 ft. 1½ in. from the center is a ⅛-in. roof plate which is flanged inward at the upper end between the posts and carlines, thus serving as longitudinal stiffeners at these points. It will be noted that this plate covers the joint between the side posts and carlines. The middle of the roof is covered with 1/16-in. plate which overlaps the thicker sheets at the sides.

The end structure is built up on double posts of the same section as the side posts, with 4-in. Z-bars at the corners. The platform end posts are 8-in. Man-Ten channels secured at the top by angles and gussets which are in turn fastened to an 8-in. channel end plate laid with the flanges up. The ends of the end plates are fastened to the upper chord members by means of gussets. The door posts and corner posts are fastened to the end plate by gussets and rivets. The roof end sheets (⅛-in. thick) extend over the platform to the vestibule end sheet to which it is shaped and welded.

With the exception of the Man-Ten platform end posts the entire structure is of carbon steel. With a few exceptions the entire structure is built by welding. Rivets are used in the car structure on the sides of the car where the letter board and roof sheet are joined, at the joint of the pier panel cover plate and side sheathing at the window-sill level and where the side sheathing is secured to the side sill. The use of rivets at these points was dictated primarily by considerations of appearance. Another exception is the joint between the channel longitudinals between the side posts and carlines. Another is the attachment of the bolster center-brace casting to the center sills.





The Mail and Express Car

It will be noticed that the side posts are curved inward slightly below the window-sill level. This was done to reduce the appearance of waviness in the highly polished finished surfaces of the sides of the car.

One of the interesting features of the underframe is the use of the A. A. R. standard freight-car center-sill section which has been built up by joining two 12⅞-in. by 36.1-lb. Z-section members. The bolsters are built up of 5/16-in. steel-plate webs and flanges which are joined by welding. Where the webs have been cut away the openings have been reinforced by welding on additional 5/16-in. plates. The cross-members are 5-in. 6.7-lb. channel floor beams, of which there are twenty in the length of the car. The bolsters and these floor beams, the latter of which rest upon the top of the center sills, are framed and welded to the 5-in. by 3¼-in. by 5/16-in. longitudinal Z-bars at the sides of the car. The side

sill is completed by welding a 2-in. by 2½-in. by 3/16-in. angle to the outward projecting bottom flange of the Z-bar, thus providing a continuous surface to which the bottom of the side sheathing is attached.

The interior of the car is finished with 5/16-in. Masonite on the side and ¼-in. Sundeala on the ceiling. The ceiling is flat for 7 ft. 6 in. between the curves by which it joins the sides of the car. In the space between the roof and the ceiling is an air duct with a cross-sectional area of 280 sq. in. with openings leading into the distribution duct below the ceiling. The duct is covered with ½ in. air acoustic, outside of which is ½ in. of insulating material. Above the air duct, between the purline sections in the roof frame, 1 in. of additional Salamander insulation has been inserted.

The windows are of double glass, dehydrated, permanently secured in place, and are flush on the outside.

In laying the floor the floor beams are first covered with pressed pans of 20-gage steel which are depressed between the beams. Next is laid the insulation which consists of ½-in. Hairinsul and ¾-in. Salamander. Above this is laid a longitudinal wood under-floor of 1¼-in. tongue-and-groove material and a transverse top floor of ⅝-in. tongue-and-groove with a layer of asphalt paper between. All floor joints are sealed with mastic. The sides and roof are insulated with 1½-in. Salamander which is placed against the outside of the car with a layer of Johns-Manville deadening felt cemented to the steel.

Power Supply

Electric power for the coaches is supplied by 4-kw. Stone generators driven by a Stone-Cush or Hatcher drive, which consists of a split cast-steel gear mounted on the axle, driving a bronze worm. The worm is connected to the body-mounted generator through a splined shaft and automatic clutch. The clutch completely disconnects the generator from the drive when the car is running at low speeds or when it is standing. This allows for motoring of the generator, an easy inspection of the commutator, and also relieves the drive and generator from switching shocks. The clutch engages the generator at a speed of about 10 miles an hour. Drives of this type have now been in service on the Canadian Pacific for more than 600,000 miles.

Mail and express cars are equipped with Pitt drives. These consist of a split steel gear, mounted on the axle, driving the splined shaft through spur and bevel gears. These drives replace the older Stone generators in which automatic generator output regulation was obtained by slipping of the belt. This change necessitated the use of generator regulators. Lamp voltage is controlled by 75-amp. Stone lamp regulators.

The batteries on each car have a capacity of 450 amp.-hr. and consist of 25 type A-12-H Edison cells.

The Trucks

The cars are equipped with four-wheel trucks having Commonwealth nickel-cast-steel frames and bolsters. Those under the mail and express cars have 5½-in. by 10-in. axles fitted with Timken roller bearings. Those under the other two types of cars have 5-in. by 9-in. axles fitted with Fafnir roller bearings on the first-class coaches and with Matco roller bearings under the combination baggage and buffet coaches. The springs are of chrome-vanadium steel. All trucks are equipped with the Simplex unit-cylinder clasp brakes with Westinghouse automatic slack adjusters.

The trucks have no center pins and are equipped with a special lock which is being used for the first time on the Canadian Pacific. The body center plate is seated in a relatively deep bolster recess and the two are locked together by retainers attached to the body bolster which hook under the flanges projecting laterally beyond the front and back sides of the bolster.

Another interesting feature of the trucks is the complete profile turning of the 36½-in. rolled-steel wheels, which are thus brought into static and dynamic balance.

Fabreeka sound-deadening material is applied to the spring planks, the transom wear plates, under the side bearings and on the pull-rod guides and cylinder-lever supports. It is also used back of the upper buffer springs and around the buffer side and center stems.

The cars are fitted with Ajax single-fold diaphragms and Miner spring buffers. The mail and express cars and the combination baggage-buffet coaches are equipped with Cardwell PF6 draft gears, while the first-class coaches are equipped with the Miner A5XB type. The draft gears are designed to go solid before the buffers so that the over-solid load is delivered on the center line of the coupler. The couplers are long-shank A.A.R. Type E with swivel butts, and are carried on pendulum type centering devices. The air-brake equipment is Westinghouse Schedule UC-4. The cars are equipped with Vapor or Barco 2-in. metallic steam-heat connectors.

Freight Car Loading

WASHINGTON, D. C.

CONTINUING the seasonal decline that began two weeks before revenue freight car loading in the week ended October 31 totaled 814,175 cars. This was a decrease of 1,797 cars as compared with the week before but an increase of 132,177 cars, or 19.4 per cent, as compared with the corresponding week of last year. It was 7.6 per cent below the corresponding figure for 1930. All commodity classifications showed increases as compared with last year but miscellaneous freight, merchandise, live stock, and ore showed decreases as compared with the week before. The summary, as compiled by the Car Service Division of the Association of American Railroads, follows:

Revenue Freight Car Loading

For Week Ended Saturday, October 31

Districts	1936	1935	1934
Eastern	165,480	142,863	129,935
Allegheny	159,004	127,551	111,500
Pocahontas	59,957	50,724	43,099
Southern	114,396	96,535	91,378
Northwestern	120,449	93,864	81,457
Central Western	130,024	112,518	101,225
Southwestern	64,865	57,943	54,454
Total Western Districts	315,338	264,325	237,136
Total All Roads	814,175	681,998	613,048
Commodities			
Grain and Grain Products	33,615	33,345	27,887
Live Stock	21,966	19,565	24,568
Coal	164,598	125,398	125,354
Coke	11,033	7,018	5,745
Forest Products	36,438	29,194	21,687
Ore	40,567	23,244	10,707
Merchandise L.C.L.	170,590	165,375	161,967
Miscellaneous	335,368	278,859	235,133
October 31	814,175	681,998	613,048
October 24	815,972	710,621	624,808
October 17	826,155	732,304	640,727
October 10	820,195	734,154	636,999
October 3	819,126	705,974	632,406
Cumulative Total, 44 Weeks	30,274,215	26,677,135	26,510,440

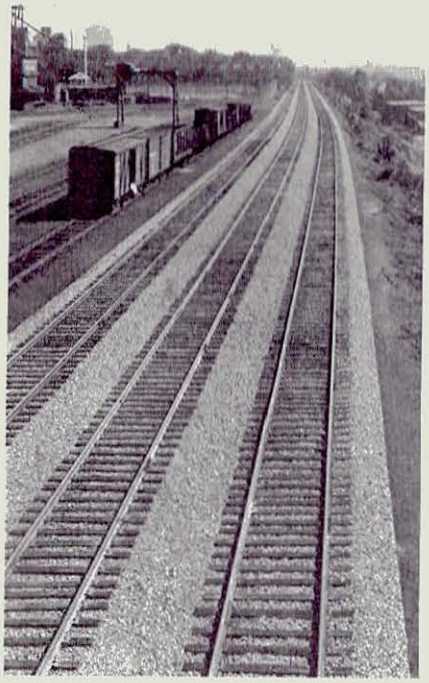
Car Loading in Canada

Car loadings in Canada for the week ended October 31 totaled 57,983 cars, as against 59,955 for the previous

(*Continued on page 718*)

Railroad Work fo
Cuts Relie

Government-fostered plan for utilizing men in maintenance of way operations at public expense for wages, has worked out satisfactorily—Much constructive work has been accomplished



This Three-Track Canadian Pacific Line into Montreal Was Overhauled by a Gang of 900 Men from One of the Relief Camps

BEGINNING in April of this year, 193 government-conducted labor relief camps throughout the Dominion of Canada, corresponding in many respects to the Civilian Conservation Corps (CCC) camps in the United States, were closed, and approximately 10,000 men in the camps were given employment in track maintenance and betterment work on the Canadian Pacific and the Canadian National, with the government paying to each man through the railways the prevailing basic rate of pay for extra-gang labor. This plan, which has been in effect throughout the last summer, and is only now being brought to a close with the close of the working season, has worked smoothly in the many camps from coast to coast on the lines of both railways, with only isolated cases of dissatisfaction, mostly of an inconsequential nature. At the same time, the government has saved the cost of operating its own relief camps, the railways and the public have benefitted and will continue to benefit through better track and better riding conditions, and the men themselves throughout the period of employment were again self-supporting, self-respected units of society with improved morale and outlook.

Effective Work Done

The most significant fact as regards the plan from the standpoint of the railways is the speed with which the relief forces adapted themselves to the various classes of work undertaken, having by midsummer carried out many miles of effective work on both roads, with an efficiency, in some cases, not exceeded by the regular extra-gang summer maintenance forces of the roads. On both roads there is general commendation of the work that has been done by the relief forces.

The programs carried out by the relief laborers on the two railways have been distinctly separate from those of the regular maintenance of way forces in order not to interfere with the work normally performed by these forces, or by the regular summer extra-gang forces which are generally recruited locally along the line. In other words, care was exercised throughout that the giving of employment to the men in the government camps did not cause unemployment in localities along the lines of the railways. The programs of the relief forces have included such items as bank and cut widening; scaling rocks from cuts; ditching; correcting poor drainage conditions within and about the track; rock, gravel and cinder ballasting; ballast screening; track surfacing; track trimming or dressing; track weeding; brush cutting; right-of-way fence construction and repairs; planting evergreen snow hedges; and general tidying-up work. No attempt was made to employ the men in such specialized operations as tie renewals and rail laying, these operations being reserved for the more experienced regular forces of the railways, which, to a large extent were relieved of the classes of work carried out by the relief forces. On the Eastern lines of the Canadian Pacific alone, it is estimated that by the end of the working season the relief forces will have completed approximately 287 track miles of bank widening, 466 miles of gravel, rock and cinder ballasting, 396 miles of track surfacing, and ditching work of various extent and character over more than 163 miles of line. Comparable programs of work will also have been completed on the Western lines of the Canadian Pacific and on the three regions of the Canadian National.

Dissatisfaction With Government Camps

The policy adopted in Canada of closing the government relief camps and offering employment on the railways to approximately 10,000 of the men in the camps, at government expense for wages, was the outgrowth of growing dissatisfaction with the conditions in the relief camps, the amount and character of the work being

Unemployed Problem in Canada

Early this year, the Canadian government closed all unemployment relief camps throughout the Dominion and arranged with the Canadian National and the Canadian Pacific Railways to extend their programs of maintenance of way and betterment work to give employment to approximately 10,000 men from the camps, the government agreeing to pay the men the same rates as ordinary extra-gang labor. This article outlines the problem presented in Canada and the agreements entered into by the railways, and discusses the conditions under which the men have worked and the results which have been accomplished.

accomplished, and the high costs involved, and also the quite general feeling that the camps, which offered no opportunity for re-establishing the men in society on a self-supporting basis, might, of necessity, become perpetual institutions housing thousands of men with a status little better than wards of the State. A special committee appointed by the government to investigate the situation with respect to the relief camps began a comprehensive survey of conditions early in December, 1935. After visiting approximately 50 camps between Valcartier in the East and Vancouver Island in the West, and interviewing members of Parliament, military officers, cabinet members, and provincial and city officials, the committee submitted a detailed report of the conditions found, and while many of its observations were commendatory to the management and personnel of the camps, it made the following fundamental recommendations:

"It is of the most pressing importance that very determined efforts should be made to explore the resources of Canada, both public and private, for the purpose of developing fields of industrial employment in order that the various types of men housed in the camps might be absorbed as speedily as possible in useful work at current rates of wages and thus become self-sustaining. In other words, it is eminently desirable that the camps, whether operated on the present basis or on any other relief basis, should be closed as soon as possible in the best interest of the State and for the sound, healthy development of the majority of the men now in the camps."

In recommending the finding of employment for the men on a work-and-wage basis, the committee pointed out many advantages, including the creation of self-respect and the spirit of initiative and individualism in the men, the correction of abuses which would save large expense to the government, and the carrying out of worthwhile undertakings which could be run on a sound economic basis.

Largely upon the report and recommendations of the committee, the Department of Labor of the Dominion sought to close the government camps and to find gainful employment for the men, principally on farms and on the railways. So far as the railways were concerned, it went directly to the Canadian National and to the Canadian Pacific with its problem and asked for their co-operation. The railways advised the government that each of them during 1936 could use effectively in main-

A Gang of 90 Men Screening Ballast and Dressing the Track at the Canadian Pacific's Windsor Station at Montreal

Relief Forces Surfacing Track on the Main Line of the Canadian National in Ontario

tenance of way work approximately 5,000 men more than they could actually afford to employ, or would employ under present conditions. At the same time, they agreed tentatively that if this additional labor was furnished to them from the relief camps at government expense for wages, they would be willing to assume the additional expenditures which would be necessary in connection therewith for material, equipment, worktrain service and supervision.

As a result of this general understanding with the railways, the following item was included in the Interim Supply Bill presented in Parliament and acted upon early in May:

"Other projects—To provide for reimbursement to the Canadian Pacific Railway Company and to the Canadian National Railway Company, upon such terms and conditions as the governor-in-counsel may determine, of expenditures to be made by each of the said companies for:

(a) Labor in the employment of certain unemployment relief forces on special work in the extension of the said company's programs of maintenance of way and betterment works during the year 1936;

(b) Workmen's compensation liability, relative to such labor;

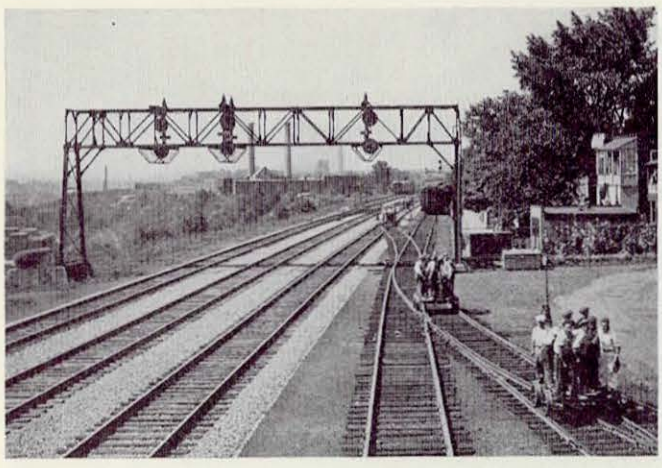
(c) Certain allowances for transportation of such labor;

(d) Certain other expenditures for labor, material and overhead incurred by the railway companies if such expenditures are made during 1936 in preparation for or in the completion of work expected to be performed by the unemployment relief forces but not performed because of shortage of unemployment relief forces, not exceeding in the aggregate, $3,100,000."

During the discussion of the item in the House of Commons, it was brought out that the expenditure proposed by the government had the three-fold purpose of relieving the government of abnormally high labor relief camp costs; of providing normal constructive work on a prevailing wage basis for the many unemployed single men in the Dominion; and of assisting the railways in catching up on unavoidably deferred maintenance of way work. C. D. Howe, Dominion minister of railways and canals, pointed out that the relief camps established by the government, which had been housing between 10,000 and 20,000 men, depending upon the season of the year, had cost the country $9,000,000 during the last year, a sum hardly commensurate with the work performed or the benefits derived. He said that it was in view of this situation and the many justified criticisms of the camps from within and without, the government decided to close the camps, and, seeking a substitute for them wherein the men could work under proper supervision in organizations capable of employing them under good conditions and with adequate equipment, approached the railways to secure assistance.

In the discussion which continued on this item, it was made clear that the privately-owned Canadian Pacific railway and the government-owned Canadian National railways were to be treated alike; that the work would be confined to track maintenance and betterment items; and that while first consideration for the jobs on the railways would be given to the men in the government camps to be abandoned, there was nothing to prevent the government from supplying men from unemployed not housed within the camps.

Section (d) of the item was explained both as a "saving" clause for the government, and as protection to the railways against loss in the event of large expenditures on their part for materials, equipment and overhead in preparing for the use of the large relief forces, and then to find circumstances which would make it impossible for the government to provide sufficient unemployment relief forces to take advantage of these expenditures. There was some objection to this section on the basis that some of the money to be appropriated might be spent for other than wages, but opposition in this respect was not pressed when it was made clear that the large number of men on relief in the Dominion made it highly improbable that the stipulation would come into play.



A Gang of 56 Relief Men Returning from Work on Seven Hand Cars

Details of Agreements

In the identical agreements between the government and the two railways, dated June 3, 1936, which followed the adoption of the Interim Supply Bill, each company agreed to increase its normal program of maintenance of way work during the subsequent four to six months so as to furnish employment for approximately 5,000 men who had been receiving assistance from the government. The government agreed to reimburse each railway for wages paid to the men employed up to the sum of $1,502,450, and also for any amounts that each road might be required to pay under any statute for the protection or compensation of the men arising out of injury to or death of any of them. In addition, it agreed to loan to each company an amount, not exceeding $554,700, necessary to defray the special expenditures for labor to which

it would be put in preparation for and in carrying out the work to be done by the relief forces. In the event of such loan, it was provided that the money should be repaid to the government in five equal annual installments in each of the years 1938 to 1942, inclusive, together with interest at the rate of 2½ per cent per annum on the amount from time to time still due.

The agreements stipulated that the railway companies pay the men furnished by the government the same rates of wages paid to their regular extra-gang laborers in the district in which the work is performed, and that they could make the same deductions for board and lodging, if required, and for medical aid, as they make from the wages of their regular extra-gang forces. The agreements further established a basic eight-hour working day, but, recognizing the seasonal character of the work to be performed and normal interruptions due to weather conditions, permitted overtime, providing that the men should be paid overtime pro rata for the additional time worked beyond eight hours. It was distinctly stated in the agreement with each road that the men furnished by the government were subject to discipline in the same manner as other extra-gang laborers, and could be dismissed at any time for cause. In effect, since the relief forces were to become railway employees, it was the aim to make their working conditions comparable in every way with those of the forces usually employed on extra-gang work.

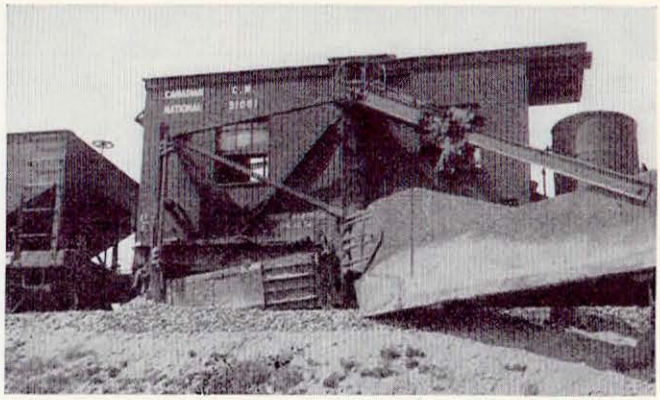
Each railway agreed to provide free transportation for the men from the government camps to camp headquarters on the railways where the movement was in the same province and entirely on its own lines. In cases where the men were to be moved from one province into another, but entirely on the lines of one road, the government agreed to pay the company for such transportation at a special reduced rate for distances carried in excess of 500 miles.

Where the movement of the men to their railroad jobs involved their transportation over the lines of both the Canadian National and the Canadian Pacific, whether within one or more provinces, the government agreed to pay for the transportation of the men at the special reduced rate for the distances they were carried on the originating road. In addition to the specific sum agreed to be paid by the government for the transportation of the men to the railway camps, the government also agreed to bear all other expenses incurred in respect to the delivery of the men to the railway, including, essentially, those for meals and sleeping accommodations, where necessary.

While not specifically stated in the original agreement between the government and the railways, it was subsequently agreed that upon the completion of the program of track maintenance work to be carried out by the relief forces, each railway would provide free transportation for the men to the nearest division point on its lines, beyond which point the men would be required to pay, from their own earnings at a reduced rate, for further transportation to their homes. The primary purpose of this arrangement for the disbanding of the men following the completion of their period of employment on the railways was to relieve both the railways and the government of criticism which would undoubtedly result if they were responsible for or a party to the possible concentration of the large number of men, again without immediate work, in the larger cities or in communities already confronted with relief problems.

Large Expenditures Required of Railways

The outstanding responsibilities accepted by the railways in their agreement with the government were first,



Several Hundred Miles of Track on Both the Canadian National and the Canadian Pacific Were Ballasted With Stone or Gravel

to prepare programs of maintenance of way work over and above those which would normally be carried out during the working season of 1936, sufficient to employ efficiently approximately 5,000 additional men on each road; and second, to bear the expense for all track materials, supplies, new equipment, equipment rentals, boarding cars, etc., required in connection with the carrying out of their enlarged programs of work and in the housing of the men. These items of expenditure were over and above the additional expenditures necessary on the part of both railways for the supervision which they were required to provide in connection with the utilization of the relief forces, money for which, if desired, could be borrowed from the government to the extent of $554,700 by each road, as previously pointed out.

That the out-of-pocket expense to the railways in connection with the employment of the relief forces has been considerable is indicated clearly in the fact that approximately 2,000 unemployed experienced railway men were re-employed by the two roads in various supervisory capacities and for providing the additional train service occasioned by the increased work. As a matter of fact, it is estimated that the total added expenditures which will have been necessary on the part of the Canadian Pacific in the employment of the relief forces will exceed in amount the cost of the wages of the men to be borne by the government.

Large Extra Force Presented Problems

The employment of the relief forces on the railways began on April 22 with the start of the demobilization of the government camps, and was carried out over a period of approximately two months in the most orderly

The Older and Less Robust Men Were Frequently Given Lighter Tasks Near the Camps, Such as Weeding and General Policing

manner, distributing the men to the railways in groups of up to 100 men. By June 30, 8,853 men from the camps had been placed on the railways from Nova Scotia to British Columbia, and 2,297 unemployed men from other sources had been given employment in maintenance of way work after the supply at the camps had been exhausted.

No coercion was used in interesting the men in accepting railway employment. They were merely given to understand that the government camps were to be closed and were offered positions on the railways on the regular wage basis of extra-gang employees, 25 cents an hour being the minimum wage for common labor. The railways were required to accept in employment all those who presented themselves from the camps, including men of all ages and varying physical ability, but have been free to utilize the men as they have seen fit to the best advantage, and to dismiss those men who were unfit or clearly undesirable.

In preparing to take care of the large number of extra laborers from the camps, the railways were confronted with a shortage of camp car equipment, but quickly remedied this situation by fitting up several hundred new camp cars from box cars, coaches and colonists cars, the latter being a sleeper type of car with upper and lower berths, used extensively in Canada in years prior to the depression for moving colonists into the interior and western provinces. Together, the Eastern and Western lines of the Canadian Pacific converted a total of 60 passenger cars, 102 colonists cars and 415 box cars into additional camp cars to accommodate the relief forces, while the three regions of the Canadian National put in service a total of 840 additional cars, including 36 passenger cars, 40 colonist cars, 590 box cars, 65 vans (cabooses), 25 refrigerator cars, and 84 various types of units for transporting water.

The camp equipment that has been housing the relief forces is at least as good as the equipment used to house the regular summer extra-gang forces of the roads. This condition was brought about largely by the fact that much of the camp equipment used by the relief workers was newer than the regular extra-gang equipment, and included many passenger train cars converted into dining and sleeping cars.

The providing of table board for the large relief forces was, for the most part, turned over to the large, well-equipped boarding contractors which for many years have handled the boarding of all extra-gang labor on the Canadian Pacific, and the majority of such labor on the Canadian National. Some of the relief camps on the Canadian National were run by the boarding car department of the road. In all of the various camps, the men have been provided with clean, wholesome food, there being no rationing or limiting of servings as in the government camps.

Output of Men Surprising

One of the most surprising facts developed in the working out of this plan is the extent to which the relief forces adapted themselves to railway work, until shortly they were accomplishing results comparable to those being achieved by the more experienced regular extra-gang forces. On both roads, adequate supervision has been given the relief forces, and adequate tools, equipment and materials have been provided to keep the men efficiently and constructively employed. The men have not been pushed, but were given to understand at the outset that continuance of their employment depended upon their willingness to produce a good day's work. As a result of these influences, and the general satisfactory conditions in the camps, the men have worked with an air of satisfaction not uncommon among regular maintenance of way employees generally.

Looking back over the summer, both of the railways have completed a large volume of additional roadway maintenance work which they would not have undertaken under normal conditions; the government has been relieved, at least temporarily, in a most satisfactory manner, of the brunt of its unemployment problem; and many of the men employed on the railways have revitalized themselves and are now in a position to carry on, from accumulated earnings, until further employment is found, either through the general improvement of industrial conditions or through further government assistance. As a matter of fact, a number of the men, resigning from the railway camps, have already found steady employment in other fields.

Factors in Success of Plan

The success of this plan was due to a number of factors, possibly the most important of which were the close co-operation which existed between the government and the railways, the good living and working conditions provided for the men, the adequate supervision provided and the favorable psychological effect on the men themselves of being constructively employed on worthwhile work on a regular wage basis. Another factor which, no doubt, contributed largely to the success of the plan, was the care with which the men were selected for the different gangs and camps, avoiding the mixing of nationalities with strongly diverging characteristics, and the studious effort made to avoid disturbing local unemployment problems by moving men from one territory into another.

Still another factor which had a beneficial effect upon the morale of the men in the camps and the working out of the plan in general, was the influence in the camps of the Frontier college, an institution in Canada which, for more than 30 years, has been endeavoring to bring opportunity for education and wholesome leadership to migratory men in the camps of various industries throughout the Dominion. During the last summer approximately 100 men from the college have lived with and worked daily alongside the men in the relief railway camps, devoting their evenings to instructing the men, in classes and in personal interviews, in subjects which would enable them to make progress in some line of practical study. This work on the part of the college was widely accepted and appreciated by the men, and, unquestionably, produced a steadying effect upon many of them which reflected itself in the favorable conditions in the camps and in the quality of work which was performed.

Freight Car Loading

(Continued from page 713)

week and 52,177 cars for the corresponding week last year, according to the compilation of The Dominion Statistics Bureau.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada:		
October 31, 1936	57,983	25,943
October 24, 1936	59,955	26,219
October 17, 1936	55,182	24,492
November 2, 1935	52,177	22,715
Cumulative Totals for Canada:		
October 31, 1936	2,082,639	1,019,073
November 2, 1935	1,994,945	936,046
November 3, 1934	1,968,062	945,505

Our Transport Plant Is Overbuilt*

Wasteful to spend for highways and waterways to parallel railways which, if all costs are considered, may be the more economical agency

By Dr. Harold G. Moulton
President, Brookings Institution

THE investment in transportation routes and facilities is equal to something like 15 per cent of the entire wealth of the nation, and exceeds the aggregate value of all our farm lands and farm buildings. The operating revenues of the railways during the past 25 years have normally run from 8 to 9 per cent of the aggregate revenues—or income—arising out of the nation's productive operations. The wages paid by railroads and other transportation companies are equal to more than 15 per cent of the total wage bill of the nation.

These statements showing the relation between transportation investment, revenues, and wages and the aggregate wealth, income, and wages of the nation, indicate in a general way how much transportation costs the rest of the economic system. If 15 percent of the total national income is paid to transportation companies for the services which they render, it is evident that, in the large, the transportation companies have charged for their services something like 15 percent of the value of all goods and services produced.

We have had in recent years a great increase in efficiency both in rail and highway transportation. The improvement of highways and the increasing size, speed, and flexibility of trucks have substantially reduced the costs of highway transportation. On the railroad side, the enormous expenditures that have been made in the past fifteen years for the purchase of new and more efficient equipment and for the improvement of roadway and structures, signaling devices, etc., have reduced the unit cost of moving freight at least one-third.

But the results of these technical and managerial improvements have been substantially nullified or offset by other developments pertaining to the organization of the transportation system as a whole. It is an arresting fact that with a net increase in total railway investment of 4.1 billion dollars from 1923 to 1929 there were no significant reductions in transportation charges to shippers. Passenger revenues decreased from 3.03 to 2.81 cents per passenger mile and freight revenues from 1.13 to 1.09 cents per ton mile, these reductions being materially less than the decrease in the general level of prices of manufactured goods. Meanwhile the rate of return on railway investment increased a little but not sufficiently to provide adequate reserves against a period of depression.

The explanation of this phenomenon is to be found in the failure of railroad traffic to increase in line with investment. While the net investment in the railways was expanded by about 20 per cent, the ton miles of freight traffic increased only about 8 per cent and the number of passenger miles decreased by nearly 20 per cent.

The situation in the twenties is in striking contrast to that in the twenty-five years prior to the war. Between 1888 and 1913 the ton miles of freight traffic increased from 68.7 billions to 301.7 billions, or nearly four and a half times. Meanwhile the receipts per ton mile of freight decreased by 27 per cent during a period when the general level of wholesale prices rose by 22 per cent. On the passenger side the number of passenger miles increased three-fold and passenger receipts per mile decreased by 15 per cent. It is of interest also to compare the traffic trends during these two periods in relation to population. In the former period the ton miles of freight per capita increased three-fold, while the passenger miles per capita doubled. From 1923 to 1929, on the other hand, the ton miles of freight per capita remained almost exactly stationary, while the passenger miles per capita decreased by about 30 per cent.

The failure of railroad traffic to increase in a period of expanding population and expanding volume of business is of course attributable to the competition of other forms of transportation. If the capturing of traffic by other transportation agencies were based solely upon demonstrated efficiency and economy in the movement of goods, we would have to conclude that the developments which have occurred are definitely in the national interest, that the railroads are falling behind the march of progress and destined to play a role of second-

Overinvestment in Transport Proving Costly to the Nation

The failure of railroad traffic to increase is attributable to the competition of other forms of transportation. But it is emphatically not the case that the inferiority of railroad transportation has been demonstrated. Both water and highway transportation have been subsidized, and inequalities in taxation, in regulation, wages and employment conditions have profoundly influenced the conditions of competition.

The comparative rates quoted to shippers do not reflect real costs. To the degree that subsidies or relief from taxation is afforded to any type of transportation agency, that agency is able to quote rates which are less than the economic costs of performing the service. Traffic may in consequence often be shipped by other than the cheapest method—all elements of cost included. The piling up of investment in transportation has served to increase the cost of transportation as a whole.

* Abstract of an address delivered at the annual meeting of the Railway Business Association, New York, November 5.

ary importance in the future, if not to go the way of the stagecoach and the covered wagon.

Factors Influencing Conditions of Competition

But it is emphatically not the case that the inferiority of railroad transportation from the standpoint of cost and service has been demonstrated. Both water and highway transportation have been subsidized—the former to the full extent of the overhead costs, and the latter extensively, though in varying degree in different states and under differing conditions. Moreover, inequalities in taxation, and in regulations with respect to public requirements and standards, wages and employment conditions, have profoundly influenced the conditions of competition.

Three results flow from this anomalous situation:

First, the comparative rates quoted to shippers do not reflect real costs. To the degree that subsidies or relief from taxation is afforded to any particular type of transportation agency, that agency is able to quote rates which are less than the economic costs of performing the service. The balance is defrayed by the public treasury, which means ultimately by the taxpayers of the country.

Second, traffic may in consequence often be shipped by other than the cheapest method—all elements of cost included. Shippers are concerned with *rates*. They will route their traffic by whatever agency offers the lowest rate, regardless of whether a part of the charges are borne by taxpayers.

Third, there has been an extensive duplication of transportation facilities. We had built up by 1929 a transportation capacity, in terms of fixed properties, more than double the nation's requirements, and we also had a large volume of unutilized equipment. To a considerable extent of course we find a duplication of facilities in the railroad system alone, but in a much larger degree the excess is attributable to the growth of other forms of transportation.

This piling up of investment in the transportation industry has served to increase the costs of transportation to the nation as a whole. The failure of *railroad* traffic to grow in proportion to investment has, as we have seen, prevented any material reduction in rail charges; and in the case of other forms of transportation, the reduction in costs is more apparent than real, since the hidden subsidies are not included in the charges paid by the shipper. In the well chosen words of Mr. Joseph B. Eastman, "The time has surely come to deal with these matters with an eye to the general welfare of the community, which in the end foots the bills. The present situation is shot through with waste which somebody must pay for, and it is creating conditions which are destructive in many different ways."

Need of Co-ordinated Service

Considerable emphasis has been placed in recent years upon the importance of a co-ordinated transportation system. Railways, waterways, highways, airways, it is urged, should somehow be made to complement and supplement one another in the business of transportation. Sometimes it is assumed that the goal can be attained by co-operation between those competing agencies in the movement of traffic. And again it is assumed that specialization in transportation service is what is required—with each agency supplying the particular type of service for which it is naturally adapted.

Such conceptions as these do not focus squarely upon the vital requirement, namely, the furnishing of transportation service in the cheapest and most efficient manner possible. In pursuit of this objective there should be no predisposition to favor any particular type of transportation agency.

It is probably true that each particular type of transportation has relative advantages in the performance of certain types of service. Trucks, for example, have an advantageous flexibility of operation in terminal areas, whereas the railway train, as a transportation unit, has definite advantages in the matter of economy and speed for road haul. Whatever may be true of canal and river transportation, it is certain that both truck and railway transportation must be accorded significant places in a system of transportation.

That highway transportation cannot satisfactorily or economically entirely replace railroad transportation is evident from a simple statement of what would be involved if the highways were to carry all of the freight traffic of the nation. On a very conservative basis of estimating, it would require, to move the nation's total freight business over the highways, about six times as many employees as are now engaged in operating the railways. Including those already engaged in highway transportation, this would mean well over 20 per cent of the total labor supply of the nation. To present the picture in another way—to carry by highway a volume of traffic equal to that of 1929 would require at least 4 million additional trucks moving over inter-city highways. This is the key to the relative costs involved.

One Company Should Offer All Forms of Transport

We cannot expect to have genuinely effective co-ordination in the business of transporting goods so long as our transportation agencies remain as independently organized competing companies. Under these circumstances each agency always desires to move the traffic all the way, or as far as possible, over its facilities and there is always an attempt to make rates so as to accomplish this purpose. The reason of course is that, once loaded and on the line, the cost of moving goods added distances is relatively small. Railroad history is replete with illustrations of this principle.

This problem cannot be solved by having the government arbitrarily adjust rates so as to make traffic move part way by one agency and part by another. The question of the cheapest route, all factors considered, varies with different consignments and the special requirements involved. Such a problem can be handled effectively only by means of transportation companies having freedom to use the various forms of transportation in whatever combination experience may prove to be the most economical in moving goods or persons from any place to anywhere.

A transportation company would seek out the cheapest means or combination of means of moving traffic and would not be interested in having it moved most of the way by truck, railroad, or water, as the case might be, because of any special interest in some particular form of transportation. If it proved cheaper to send certain commodities by highway than by rail, it would send them by highway. If it proved cheaper to send them by a combination method it would use several forms of transportation. Through experimentation we would gradually ascertain the proper place of each type of transport; and if some proved to have no legitimate field they would cease to be used.

The granting of permission to companies to engage in all forms of transportation would not necessarily mean that no companies would remain as specialized agencies. We would still have, particularly in the field of local transportation, independent companies engaged in spe-

cialized services, and we would still have the private operation of trucks.

The problem of regulation would remain, to be sure. But if all our forms of transportation were placed on a basis of economic parity with respect to subsidies, taxes, etc.—with the full costs of transportation imposed where they belong, upon the shipper—and if then the business of transportation were allowed to be conducted by transportation agencies, the entire problem of regulation would be enormously simplified.

Would Government Ownership Solve Problem?

In the view of some the solution of our transportation difficulties is to be found in government ownership and operation of the railways. While there is no organized movement in this direction at the moment there is no little latent sentiment in favor of turning the railways over to the government as the best way out of a bad situation. Let us ask, therefore, whether under government ownership the basic problems which we have been discussing would automatically be solved.

If the government owned and operated the railways the following issues with respect to the relations between the railroads and other forms of transportation would immediately present themselves: (1) Should taxes be levied on railway properties but not on other transportation properties? (2) Should the investment of the government in the railway system, together with maintenance of way and structures, be considered in making rates, or should that be a charge against taxpayers as in the case of waterways? (3) Should the hours of labor and rates of pay on commercial trucks and water carriers be unregulated, or brought into adjustment with those on the government railways? (4) Should rates be adjusted with a view to maintaining each and every form of transportation in full force and vigor? (5) Should some centralized agency be created to determine the place in the sun deserved by each? (6) Should the diversion of traffic among different agencies be determined on some arbitrary basis, or should it be determined by the test of relative efficiency and economy —with all elements of cost included? (7) Should the several forms of transportation be further expanded by independently operating government agencies, without reference to total transport requirements?

These are, of course, essentially the same issues with which we are now confronted. We would get increased efficiency in transportation and lower costs only to the degree that duplicate facilities were eliminated and that traffic was permitted to move over the particular agency or combination of agencies that could perform the service most economically.

There does not appear to be good reason for believing that with government ownership and operation of the railways any solution of these basic problems would be readily possible. We are too familiar with the pressure of locality and group interests to believe that waterway appropriations and subsidies can be summarily eliminated; we are too familiar with the condition of the federal budget to believe that the government would be willing to abandon the effort to have the railways pay their way; and we are too familiar with the slow moving and cumbersome machinery of government to have confidence in any early adjustment of conflicting interests and points of view.

Rates to Be Fixed by Lobbies?

Apart from these larger issues of transportation policy we may also well take account of certain forces, pressures, and tendencies operating within government which militate against operating efficiency. Mention may be made of the new and vast opportunities for the lobbyist seeking special favors in the way of service or rates; the political bargaining between labor and the government with respect to wages and hours; and the enormous power and influence over business enterprise which would accompany the transfer of railway purchases to the government.

Railway purchases before the depression averaged nearly 2.5 billion dollars annually. They accounted for about 21 per cent of the iron and steel output of the country, 24 per cent of the coal, 15 per cent of the forest product, and 12 per cent of the fuel output, and gave employment to a half million workers in manufacturing, forestry, and mining in hundreds of cities and communities in all parts of the country. The significance of railway purchases may be indicated by noting that government purchases of materials and supplies of every kind now aggregate only about one-third the normal volume of railway purchases. The number of railway employees at present is about 1,150,000, which may be compared with about 270,000 in the postal service and 835,000 in the entire administrative division of the government. Though discussion is precluded by lack of space, the implications of government ownership and operation of the railways from the standpoint of the government budget should not be overlooked.

Such recent facts as the refusal of Congress to sanction capital improvements if they mean displacement of labor; the Florida canal episode; the accounting procedure of the Inland Waterways Corporation; the increasing disregard of Civil Service principles; and the tendency to bring hitherto independent commissions and agencies under party control do not inspire confidence that government railway operation would be on a high plane of efficiency. Nor do the independent promotional activities of the various government agencies concerned with special forms of transportation suggest satisfactory co-ordination in the development of a transportation system under government auspices.

Can Progress Be Expected?

Whatever criticisms of railway management may have been warranted at certain periods in the past no one can doubt that progress now rules the rails. Moreover, although some roads still have serious problems of financial readjustment, every indication points to a general improvement in railway financial condition and to the ability of the roads to carry out extensive programs of rehabilitation over the years ahead.

It is now recognized that railway regulation must be conceived in much broader terms than merely controlling the power of monopolies and ensuring reasonable rates to shippers. It has become apparent that unregulated and subsidized competition between rival carriers may be destructive and involve enormous economic costs to the nation. There is still confusion of thinking and conflict of policy with respect to important issues, but the recent broadening of the scope of government regulation has prepared the way for a progressive clarification of the issues involved as well as for the gradual development of more equitable and efficient standards of regulation.

The development of the transportation system by these evolutionary processes offers the surest guaranty of genuine progress.

THE NORFOLK & WESTERN reported recently the loading at Olga No. 1 mine of the Carter Coal Company, at Coalwood, W. Va., of 159,625 tons of coal in one month; the equivalent of 3,185 fifty-ton cars.

Small Roads and Poor Roads Factors in Railway Buying

Geographical comparisons also shown by detailed analyses of expenditures for materials and supplies in 1935

WHILE analyses of railway purchases leave much to be desired in drawing conclusions about the extent, relations and trends of carrier expenses for materials and supplies, they invariably give emphasis and understanding to a subject of recognized importance.

In analyses just made, expenditures by individual railroads in 1935 for various classes of materials and supplies are compared with total purchases, miles of road and operating revenues and some observations made of the relative purchases by large and small roads, solvent and insolvent roads and roads in different geographical regions. The tabulations show that while all railroads buy much the same kind of materials, the materials are not purchased in the same proportions. They also show that for the third consecutive year, purchases by Class I railroads operating less than 1,000 miles of line and also purchases by Class I roads in receivership or trusteeship took a larger proportion of their operating revenues than the purchases by the large roads and the solvent roads, respectively, although less per miles of road, while the purchases were highest per dollar of operating revenues in the New England states and highest per mile of road in the Pocahontas region.

Mileage is an imperfect measure of railway buying because it ignores traffic density and location. Obviously, the consumption is greater on double-track than on single-track roads and the freight paid in New England for coal and lumber and that paid in the West for manufactured goods, as compared with roads more advantageously situated with respect to markets, may not be disregarded. Revenues more nearly determine the buying power of the carriers. Yet the mileage measure retains its popularity because it makes up in definiteness what it lacks in completeness.

Disregarding fuel and equipment, railway purchases from manufacturers averaged $1,570 per mile of road and took 10.8 cents of each dollar of operating revenues

Regional Purchases, Materials and Fuel, 1935

	Dollars per Mile of Road Operated			Per Cent of Operating Revenues		
	Total Purch.	Ties, Rail, Misc.	Misc.	Total	Ties, Rail, Misc.	Misc.
New England	$3,490	$2,410	$1,600	28.6	16.8	13.2
Great Lakes	4,240	2,460	2,140	16.8	9.8	8.5
Central Eastern	3,730	2,170	1,990	13.2	7.6	6.9
Pocahontas	4,990	3,580	2,890	13.9	10.0	8.1
Southern	2,000	1,250	1,000	18.2	11.4	9.1
Northwestern	1,660	1,010	909	19.5	11.8	9.5
Central Western	2,400	1,460	1,220	19.0	12.6	10.5
Southwestern	1,540	990	862	19.4	12.9	11.4
United States	2,580	1,570	1,360	17.5	10.8	9.1

Purchases by Types of Roads—1935

	Dollars per Mile			Per Cent of Operating Revenue		
	Total Purch.	Ties, Rail, Misc.	Misc.	Total Purch.	Ties, Rail, Misc.	Misc.
Roads in receivership	$2,078	$1,268	$982	20.4	12.7	9.5
All other	3,022	1,850	1,498	18.3	10.2	8.8
Large roads	2,318	1,421	1,264	18.5	11.4	9.8
Small roads	2,875	1,788	1,419	18.7	11.8	8.7

Selected Divisions of Railway Purchases—Exclusive of New Equipment, 1935

	Per Cent of Total Purchases												Dollars Per Mile			Per Cent of Oper. Rev.		
	Lumber ex. X Ties	Rail	Wheels Axles Tires	Track Mat'l ex. Rail	Boiler Tubes and Flues	Tel. and Sig.	Bolts Rivets Springs	Cast-ings	Total Iron and Steel	Oils and Grease	Brass and Copper	Elec. Mat'l	Total Purch.	Ties Rail Miscel.	Miscel.	Total	Ties Rail Miscel.	Miscel.
New England Region:																		
Bangor & Aroostook	7.4	12.1	1.9	7.2	.76	.21	1.33	3.9	34.4	2.12	2.02	.765	$2,150	$1,370	$955	21.1	13.6	8.5
Boston & Maine	4.0	.13	3.2	.8	.37	2.0	1.33	3.09	19.0	2.5	3.8	1.28	3,480	1,695	1,560	16.0	7.8	7.2
Central Vt.	1.2	...	...	...	...	...	...	...	...	...	...	...	3,490	2,410	1,600	28.6	16.8	13.2
Maine Central	7.5	1.7	1.8	.9	.65	1.74	.97	2.0	16.6	2.3	2.1	.92	2,180	1,030	830	20.7	9.7	8.1
N. Y. N. H. & H.	3.3	...	1.58	1.1	.17	1.66	1.33	3.7	18.8	1.5	2.76	4.58	5,420	3,030	2,840	15.2	8.5	7.9
Average	4.26	.7	2.14	3.0	.32	1.73	1.22	3.3	19.4	1.9	3.0	2.9	2,460	1,840	1,650	16.7	8.9	8.0
Great Lakes Region:																		
Ann Arbor	1.4	...	1.4	1.5	1.6	.44	.44	3.3	30.7	.12	1.9	.29	3,090	1,370	1,170	23.0	10.2	8.6
Cambria & Indiana	2.0	3.8	1.25	4.1	1.3	.07	3.2	8.9	36.6	2.28	1.3	.28	1,880	1,345	974	10.0	7.2	5.2
Delaware & Hudson	6.1	3.2	3.3	4.3	.56	2.3	2.5	5.8	35.0	1.5	1.7	.66	5,820	3,590	2,970	21.8	13.4	11.1
D. L. & W.	1.98	2.7	2.58	8.2	.12	1.2	.95	3.06	29.4	2.2	1.48	1.29	9,240	5,100	4,550	20.6	11.3	10.2
Detroit & Mack.	2.0	8.8	1.66	8.0	.14	.61	.59	3.48	29.7	2.1	.68	.62	695	434	255	25.8	16.1	9.4
Detr. & T. S. L.	3.5	...	2.2	.79	2.4	.8	1.52	2.9	18.2	1.47	2.1	.43	6,831	2,480	2,480	9.1	3.5	3.5
Erie	3.5	5.6	3.28	3.8	.64	1.6	2.06	4.01	30.7	3.3	3.2	1.1	4,670	2,721	2,260	15.0	8.8	7.2
L. & N. E.	3.3	...	3.37	2.69	.43	1.55	2.25	3.2	24.0	2.4	2.19	1.3	2,290	1,090	990	14.8	7.0	6.4
Lehigh Valley	3.5	.52	2.16	.59	.12	.68	1.67	12.1	28.4	2.6	3.8	.82	6,120	3,100	3,000	20.3	10.2	9.9
Monongahela	4.7	6.56	1.08	13.9	.23	.28	.99	3.48	31.8	1.6	2.37	.72	1,750	1,180	731	8.1	5.5	3.4
Montour	2.4	6.5	3.9	2.38	.69	.97	2.33	11.6	44.4	5.15	3.8	.76	5,150	3,660	3,050	14.8	10.5	8.8
New York Central	3.0	2.98	4.03	4.25	2.01	1.6	2.24	3.8	31.2	2.52	5.65	2.9	4,400	2,750	2,460	15.4	10.0	8.6
N. Y. C. & St. L.	3.0	3.78	2.0	4.88	.27	1.61	.87	2.6	21.8	2.38	1.86	.67	2,920	1,390	1,050	14.2	6.7	5.1
N. Y. O. & W.	1.87	...	4.08	.52	.31	2.02	1.26	2.9	17.0	2.7	2.6	.75	2,370	806	750	15.7	5.3	4.9
Pere Marquette	3.1	2.64	3.4	4.18	.19	.87	.29	6.2	23.4	1.16	1.95	.95	2,500	1,270	941	18.4	9.4	6.9
Pitts. & Shawmut	6.0	14.0	1.64	4.18	.77	.14	.85	.65	24.8	2.3	.35	.29	1,360	1,010	415	24.8	18.4	7.6
Pitts. & W. Va.	5.4	1.09	5.55	3.06	1.03	.66	2.92	3.32	26.6	2.25	5.4	1.4	2,770	1,910	1,585	12.4	8.6	7.1
Pitts. Shaw. & Nor.	3.5	...	3.35	1.99	1.09	.48	1.16	2.26	16.7	3.18	3.08	.66	800	506	292	17.0	10.7	6.2
Wabash	4.8	8.06	2.97	7.24	.33	.96	1.59	4.14	34.2	1.86	2.76	.86	2,740	1,690	1,290	16.6	10.3	7.8
Average	3.25	3.26	3.38	4.26	1.15	1.42	1.86	4.54	29.7	2.4	3.99	.63	4,240	2,460	2,140	16.8	9.8	8.5

Selected Divisions of Railway Purchases—Exclusive of New Equipment, 1935—Continued

	Per Cent of Total Purchases												Dollars Per Mile			Per Cent of Oper. Rev.		
	Lumber ex. X Ties	Rail	Wheels Axles Tires	Track Mat'l ex. Rail	Boiler Tubes and Flues	Tel. and Sig.	Bolts Rivets Springs	Cast-ings	Total Iron and Steel	Oils and Grease	Brass and Copper	Elec. Mat'l	Total Purch.	Ties Rail Miscel.	Miscel.	Total	Ties Rail Miscel.	Miscel.
Central Eastern Region:																		
Alton & Southern..	3.2	15.5	1.47	10.76	.13	1.33	.52	3.03	40.0	5.96	1.9	.56	6,340	3,900	2,800	...	...	...
B. & O.	4.1	.20	2.57	2.25	.79	.79	1.66	3.78	21.6	2.6	2.7	3.5	3,280	1,875	1,750	14.4	8.3	7.7
Bess. & Lk. Erie...	4.9	3.6	.90	5.5	1.08	.25	2.8	12.2	46.0	2.43	2.46	.54	7,390	6,050	4,610	16.7	14.0	10.6
Cent. of N. J.	2.9	...	4.28	2.69	.41	1.58	.71	2.24	16.6	2.09	2.99	1.76	6,590	2,700	2,589	15.4	6.4	6.0
C. & E. I.	3.0	7.9	1.4	5.85	.38	1.38	1.68	6.09	32.3	3.68	3.72	1.44	2,540	1,675	1,260	17.7	11.6	9.7
C. & I. M.	5.12	6.56	4.32	5.3	.46	.87	3.88	8.2	42.9	4.16	4.04	1.29	4,390	3,290	2,920	17.8	13.3	11.8
C. I. & L.	4.0	1.75	2.39	1.91	.88	2.41	1.87	4.46	21.5	3.8	3.67	1.09	1,710	1,040	896	13.0	7.9	6.8
D. T. & I.	6.3	9.54	2.96	6.27	.30	1.14	.87	8.96	40.9	2.12	4.52	.66	2,140	1,525	1,065	12.5	8.9	6.2
E. J. & E.	7.0	...	1.41	4.24	.54	1.06	3.8	6.06	28.7	3.7	2.99	.56	1,765	1,180	944	12.6	8.9	6.8
Penna., L. I. & SS Lines	1.63	...	3.95	1.79	.47	2.19	1.65	3.4	25.1	1.95	1.27	5.56	4,010	2,340	2,270	11.4	6.6	6.4
Reading	3.32	...	3.35	.30	.50	1.45	1.0	3.76	21.9	1.61	.74	1.13	5,010	2,080	2,050	14.3	6.0	5.8
Western Md.	5.2	3.58	3.8	6.28	.89	1.14	.90	2.82	29.0	2.49	4.3	.39	3,200	2,260	1,710	19.0	13.5	10.2
W. & L. E.	4.5	7.9	4.5	6.33	1.52	.18	1.69	8.2	52.0	1.9	.78	1.11	5,740	4,560	3,500	21.8	17.9	13.3
Average	2.82	1.19	3.38	2.27	.56	1.63	1.6	3.8	25.2	2.24	1.94	3.92	3,730	2,170	1,990	13.2	7.6	6.9
Pocahontas Region:																		
C. & O.	4.15	6.4	1.69	5.07	.28	2.63	1.41	4.76	37.2	2.3	2.0	1.15	4,300	2,980	2,440	11.5	8.0	6.5
Norfolk & Western.	2.59	13.2	.93	11.9	.23	1.37	1.41	1.50	42.6	2.88	1.8	2.2	6,100	4,600	3,690	17.0	12.8	10.3
R. F. & P.	2.40	4.06	5.95	3.33	.49	.63	1.68	5.2	32.2	2.68	3.19	5.31	14,300	7,860	6,760	24.2	14.1	12.3
Virginian	1.9	4.4	3.18	3.69	.15	.24	1.67	8.36	46.4	3.55	.46	1.39	3,120	2,290	1,895	12.0	8.8	7.3
Average	3.39	9.21	1.62	7.96	.26	1.81	1.47	3.62	39.8	2.66	1.88	1.85	4,990	3,580	2,890	13.9	10.0	8.1
Southern Region:																		
A. & W. P.	...	2.02	...	...	...	...	...	...	...	...	...	...	2,220	1,110	1,045	20.0	10.0	9.4
A. B. & C.	7.2	2.8	5.92	3.16	.20	.08	1.95	3.89	24.4	2.38	6.49	.51	1,030	669	497	21.8	14.2	10.5
A. C. L.	3.2	2.4	2.07	1.61	.40	.88	.55	.96	17.6	1.55	4.1	1.39	1,580	866	710	20.8	11.4	9.3
Cent. of Ga.	6.8	7.5	3.47	3.79	.65	.73	1.63	7.75	32.8	2.4	2.98	1.92	1,685	1,115	886	22.5	14.9	11.9
Charleston & W. Car.	7.2	4.55	2.62	4.38	.14	...	.91	2.65	22.5	1.89	1.68	.37	1,270	801	495	22.4	14.1	8.6
Clinchfield	4.5	5.34	5.84	2.0	.89	...	2.69	4.75	36.3	2.4	3.54	.55	2,580	1,755	1,370	15.0	10.2	7.9
Col. & Grnville.	14.2	1.07	3.67	3.39	.38	...	1.64	1.74	17.9	2.61	1.92	.70	1,300	834	607	22.1	14.2	10.3
F. E. C.	5.24	...	5.74	1.33	.45	1.05	1.49	3.95	22.5	1.88	1.01	1.67	1,940	1,050	870	20.3	11.1	9.2
Ga. & Fla.	10.9	...	2.53	2.26	.01	...	.79	3.76	15.9	1.17	2.3	.46	800	489	340	29.8	18.3	11.4
G. M. & N.	9.7	13.6	2.38	5.57	.70	.31	1.0	2.42	32.4	2.2	2.67	.56	1,165	849	528	17.7	12.7	8.0
I. C.	5.57	2.09	3.18	2.33	.24	.97	1.2	3.07	22.1	4.38	2.92	1.77	2,580	1,550	1,325	17.7	11.0	9.2
L. & N.	4.14	4.6	4.9	4.63	1.32	1.78	1.87	4.61	35.0	3.03	1.72	1.12	2,440	1,590	1,415	16.3	10.7	9.4
M. & O.	12.7	5.8	3.92	3.55	.55	.17	1.95	3.34	25.6	2.58	3.8	.60	1,580	1,160	760	21.4	14.5	10.3
N. C. & St. L.	6.1	6.9	3.23	3.83	.25	1.68	1.22	4.4	32.2	3.06	1.09	.71	1,985	1,270	990	18.9	12.0	9.5
Norfolk Southern.	7.7	6.29	2.2	4.71	.40	.75	2.25	2.28	27.5	1.64	1.63	.44	1,220	856	518	22.4	15.5	9.4
S. A. L.	...	5.99	...	...	...	...	...	...	...	...	...	...	1,665	1,130	914	21.1	14.3	11.6
Southern	6.0	4.71	4.0	4.27	1.07	1.86	.72	2.36	26.1	2.3	3.13	.55	2,290	1,445	1,040	17.2	10.8	7.8
Tenn. Cent.	10.0	14.1	3.62	4.08	.11	.13	1.14	2.64	31.8	4.4	1.91	.78	1,510	1,110	635	19.2	14.1	8.1
Average	5.5	4.08	3.72	3.09	.71	1.30	1.19	3.0	26.2	2.93	2.83	1.04	2,000	1,250	1,000	18.2	11.4	9.1
Northwestern Region:																		
C. & N. W.	6.5	6.8	3.12	6.3	.76	2.10	1.36	3.54	31.9	3.44	1.47	2.12	1,850	1,280	1,030	20.1	14.0	11.2
C. G. W.	2.35	6.2	4.14	8.35	.15	1.43	1.1	1.55	29.7	2.32	3.42	.67	2,320	1,170	868	21.0	11.3	8.4
C. St. P. M. & O.	3.95	1.27	1.41	2.39	1.26	.68	.89	2.09	14.8	2.44	2.22	.68	2,360	982	740	25.3	10.5	7.9
D. M. & N.	2.95	.55	1.13	4.71	.99	1.07	2.07	6.7	40.8	3.04	3.1	1.32	2,590	1,685	1,595	12.6	8.2	7.8
D. S. S. & A.	7.0	...	4.37	.03	.49	.18	1.11	2.38	13.8	2.36	1.33	.41	776	352	258	19.8	8.9	6.6
G. N.	5.31	...	1.58	1.32	.59	.48	.66	2.68	13.2	1.33	1.38	.92	1,550	766	735	15.8	7.8	7.5
Green Bay & West.	2.6	13.2	2.03	7.21	1.47	.05	.76	2.05	36.2	1.18	1.17	.43	1,980	1,290	696	32.3	21.4	11.5
Lake Sup. & Ishp.	5.7	20.8	1.34	6.43	.49	.93	1.02	7.85	53.0	1.12	.91	.85	2,110	1,580	1,010	15.2	11.4	7.2
M. St. P. & S. S. M.	5.2	2.79	3.46	5.26	.97	.31	1.85	3.3	23.6	2.45	3.52	.52	1,040	559	427	18.8	10.1	7.7
N. P.	7.11	3.47	2.47	4.0	.26	1.73	1.23	3.7	25.6	1.79	2.16	1.26	1,605	960	850	20.1	12.0	10.6
S. P. & S.	7.5	.27	...	...	...	...	...	...	19.3	...	...	...	1,190	580	495	18.4	9.1	7.6
Average	5.9	3.19	2.19	5.11	.63	1.38	1.14	3.04	24.7	2.5	2.03	1.28	1,660	1,010	909	19.5	11.8	9.5
Central Western Region:																		
Alton	5.25	10.6	2.64	3.05	.25	.63	1.34	3.0	27.3	1.68	4.49	1.54	4,400	3,430	2,700	30.2	23.8	18.4
A. T. & S. F.	3.54	3.95	3.09	3.11	.42	1.36	1.14	3.7	23.4	2.3	3.7	1.62	2,140	1,280	1,105	21.0	12.6	10.9
Bing. & Gar.	2.6	33.2	.42	14.04	...	2.59	...	3.45	59.3	.15	...	3.88	3,860	3,400	1,310	...	...	...
C. B. & Q.	3.1	3.21	4.54	5.02	.47	2.46	1.43	4.97	34.0	1.95	1.54	2.83	1,840	1,290	1,070	20.0	14.0	11.6
C. R. I. & P.	4.86	1.13	2.74	1.83	.67	.92	1.53	4.5	20.3	2.28	4.2	1.23	1,515	850	770	19.5	10.5	9.5
Colo. Sou.	7.0	1.81	2.93	1.51	...	.25	.24	.65	12.7	3.34	.01	4.09	955	454	280	15.6	7.4	4.5
D. & R. G. W.	3.0	4.14	4.36	2.95	.56	.28	1.56	7.4	31.2	3.16	3.0	1.23	1,710	1,140	894	21.2	14.2	11.0
Ft. W. & D. C.	3.6	...	3.72	.63	.89	.22	1.06	4.85	20.7	3.44	5.55	3.99	1,320	680	556	19.4	10.0	9.6
Nev. Nor.	1.6	.91	2.97	2.40	.31	4.0	1.66	.55	19.6	3.64	3.07	.66	923	465	352	36.0	18.2	13.8
P. & P. U.	7.3	...	22.3	2.45	.12	.59	2.38	.55	41.2	4.12	2.59	.41	2,240	1,470	1,450	...	...	...
S. P. (ex. T. & N. O.)	3.51	5.3	1.13	3.32	...	2.98	...	2.21	17.1	...	.20	1.65	2,440	1,180	980	18.2	8.9	7.4
U. P.	2.94	3.56	2.22	5.34	.19	1.16	1.15	8.6	34.2	2.36	3.52	1.31	3,080	1,990	1,680	22.9	14.7	12.5
Utah	3.08	...	3.68	.62	2.02	.79	.53	4.6	17.8	4.36	5.04	.91	1,280	920	480	13.4	9.7	4.7
W. P.	3.74	18.6	3.9	9.11	.12	.13	1.25	3.47	42.2	2.11	.49	.56	3,090	2,070	1,260	27.8	18.6	11.3
Average	3.55	4.3	2.8	3.92	.36	1.28	1.19	4.95	27.5	2.17	2.69	1.66	2,400	1,460	1,220	19.0	12.6	10.5
Southwestern Region:																		
K. C. S.	2.9	4.29	2.53	2.04	.39	...	.48	1.68	18.2	2.78	2.48	.41	1,960	1,175	920	17.3	10.4	8.1
K. C. Terminal	3.22	...	.63	3.71	.83	1.77	1.38	6.85	21.7	4.15	2.31	9.3						
La. & Ark.	7.5	6.5	2.14	6.4	1.38	.14	1.69	4.7	41.3	1.78	1.55	.51	1,850	1,450	1,245	23.4	18.5	15.8
M-K-T	3.66	...	2.86	2.13	.58	.81	1.35	3.69	21.9	2.59	4.05	1.25	1,250	690	612	15.0	8.3	7.3
M. P.	4.75	2.86	4.54	9.5	1.02	...	.95	...	...	2.0	...	...	2,040	1,465	1,290	21.4	15.4	13.9
St. L.-S. F.	4.76	5.1	2.75	5.57	.22	1.27	2.54	4.62	33.5	2.94	2.2	2.12	1,745	1,175	926	23.4	15.6	12.4
St. L. S. W.	8.75	...	3.53	2.63	.49	.08	1.12	11.35	28.9	2.94	4.11	.64	1,200	775	744	13.6	8.8	8.4
Term'l RR of St. L.	5.35	.27	1.75	4.34	.28	1.42	.86	2.71	16.7	2.83	2.14	4.58	1,220	614	592	...	...	...
T. & N. O.	7.5	...	1.79	5.29	.37	1.13	.91	4.1	...	2.54	2.6	2.19	1,180	636	626	15.0	8.1	8.0
Average	5.12	3.11	3.46	6.75	.70	.97	2.18	5.0	33.4	2.37	2.91	1.76	1,540	990	862	19.4	12.9	11.4
United States—Average	4.0	3.48	3.04	4.13	.64	1.40	1.46	4.04	27.7	2.44	2.71	1.84	2,580	1,570	1,360	17.5	10.8	9.1

in 1935. The corresponding purchases were equivalent to $2,410 per mile and 16.8 per cent of revenues in the New England region; $2,460 per mile and 9.8 per cent of revenues in the Great Lakes region; $2,170 per mile and 7.6 per cent of revenues in the Central Eastern region; $3,580 per mile and 10.0 per cent of revenues in the Pocahontas region; $1,250 per mile and 11.4 per cent of revenues in the Southern region; $1,010 per mile and 11.8 per cent of revenues in the Northwestern region; $1,460 per mile and 12.6 per cent of revenues in the Central Western region; and $990 per mile and 12.9 per cent of revenues in the Southwestern region.

Coal Roads Spend $5,000 Per Mile

The purchases of materials and supplies, exclusive of fuel and equipment, were larger by $2,010 per mile in

Pocahontas region than the average for the United States, and were larger by $2,590 per mile of road in the Pocahontas region than in the Southwestern region where regional totals were lowest per mile of road. In New England, where purchases were highest from the standpoint of revenues, the regional total took 6 cents more of each revenue dollar than the total for the United States, and 9.2 cents more of each revenue dollar than in the Central Eastern region where regional purchases were the lowest from the standpoint of revenues. Disregarding rail and ties, as well as fuel and equipment, the regional buying was greatest per mile of line and lowest per dollar of operating revenues in the Pocahontas region, and it was greatest per dollar of operating revenues in the New England region and lowest per mile of line in the Southwestern region.

Comparisons between the purchases made by railroads for special classes of materials, based on the proportions which the expenditures for the materials in question bear to the total purchases of each road, require that consideration be given to the fact that the relation of one class of expenditures on a railroad to its total purchases is dependent upon the relative amounts of other classes of materials purchased by the same railroad. If the expenditures made by one railroad for fuel, for example, represent a larger percentage of its total purchases than do the fuel purchases on another railroad, the difference may affect comparisons between the percentages which other classes of purchases bear to the totals. This condition, however, does not wholly destroy the value of comparisons made on this basis.

Lumber Buying Highest in West

During 1935, expenditures for lumber, exclusive of ties, averaged 4.26 per cent of the total purchases in the New England region; 3.25 per cent of total purchases in the Great Lakes region; 2.82 per cent in the Central region; 3.39 per cent in the Pocahontas region; 5.5 per cent in the Southern region; 5.9 per cent in the Northwestern region; 3.55 per cent in the Central Western region; and 7.5 per cent in the Southwestern region, as compared with an average of 5.12 per cent over the United States.

Track materials, exclusive of rail and ties, took 3.0 per cent of the dollar spent for supplies in the New England states; 4.26 per cent of the supply dollar in the Great Lakes region; 2.27 per cent in the Central Eastern region; 7.96 per cent in the Pocahontas region; 3.09 per cent in the Southern region; 5.11 per cent in the Northwestern region; 3.92 per cent in the Central Western region; and 5.29 per cent in the Southwestern region. Collectively, the purchases of iron and steel products averaged 19.4 per cent of the total purchases of materials and supplies and fuel in the New England region; 29.7 per cent in the Great Lakes region; 25.2 per cent in the Central Eastern region; 39.8 per cent in the Pocahontas region; 26.2 per cent in the Southern region; 24.7 per cent in the Northwestern region; 27.5 per cent in the Central Western region; and 33.4 per cent in the Southwestern region.

Small Roads Spend $2,875 Per Mile

That the smaller roads as well as the larger systems play an important role in swelling the buying totals of the railroads is shown graphically by figures comparing the combined purchases of the Class I roads operating 1,000 miles of line or less, with the combined purchases of Class I railroads operating 7,500 miles or more of line. In the first group are 50 railroads. During 1935, the combined purchases by the small railroads of materials and supplies, exclusive of fuel and equipment, from manufacturers were equivalent to $1,788 per mile and 11.8 per cent of their operating revenues; while the corresponding purchases made by the large roads were equivalent to $1,421 per mile and 11.4 per cent of their operating revenues. Excluding ties and rail as well as fuel and equipment, the purchases by the small roads were equivalent to $1,419 per mile of road operated and 8.7 per cent of their operating revenues, as compared with $1,269 per mile and 9.8 per cent of operating revenues in the case of the large systems.

More interesting than comparisons between the purchasing of large and small roads are those between roads whose reduced finances forced financial reorganizations and those which have managed to avoid bankruptcy proceedings. In the former category are 20 properties, including both large and small carriers. As in previous years, the purchases on the individual roads vary. Collectively, the purchases of the roads in the hands of receivers and trustees also suffer by comparison with other roads on the mileage basis. This is principally because of the smaller average intensity of their traffic. However, in 1935 as in 1934, railroads in the hands of the courts bought not only as much, but more in the aggregate per dollar of their operating revenues than did the more solvent properties.

"Receivers" Spend $2,000 Per Mile

In the aggregate, the purchases of materials and supplies, exclusive of fuel and equipment, which were made by the roads in receivership or trusteeship, were equivalent to $1,268 per mile of road operated and 12.7 per cent of operating revenues in 1935, while the corresponding purchases of railroads not in receivership averaged $1,850 per mile of road and 10.2 per cent of operating revenues. Excluding ties and rail, as well as fuel and equipment, purchases by the insolvent roads averaged $982 per mile of road and 9.5 per cent of operating revenues, while the corresponding purchases of other roads averaged $1,498 per mile of road and 8.8 per cent of operating revenues. The figures disprove the supposition often indulged in that poor roads do not buy and again give weight to the conclusion that railroads, while undergoing financial reorganization, take advantage of their freedom from immediate obligations to bondholders, to spend more of their earnings proportionately in restoring the service life of their properties than do railroads whose earnings must be accumulated to pay interest to bondholders, if not dividends to stockholders.

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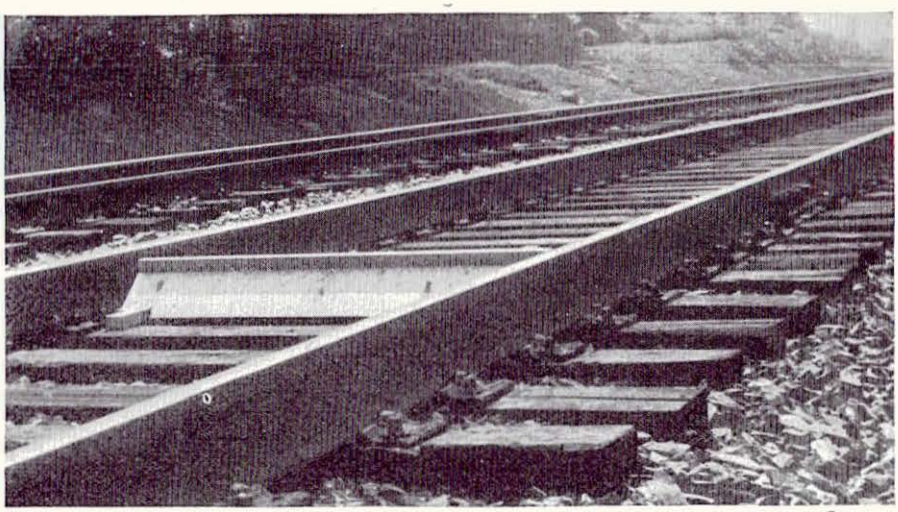
On the Chicago, Burlington & Quincy at Creston, Iowa



The Lackawanna Detector Is Located Between Running Rails

Dragging Equipment Detectors

Two roads develop electrical apparatus mounted just below rail level and so connected that when broken they affect wayside signals

TWO roads have developed and installed devices to give warning of the presence of damaged or loosened parts of cars or locomotives, that may be hanging or dragging below the level of the top of the rails, and that might cause derailments when trains are descending grades or when running through switch layouts, such as at large interlockings. Such an arrangement of drag detectors was, according to information now available, first developed by J. J. Graf, engineer of telegraph and telephone of the Delaware, Lackawanna & Western, and was first installed at West Henryville, Pa., on April 22, 1931.

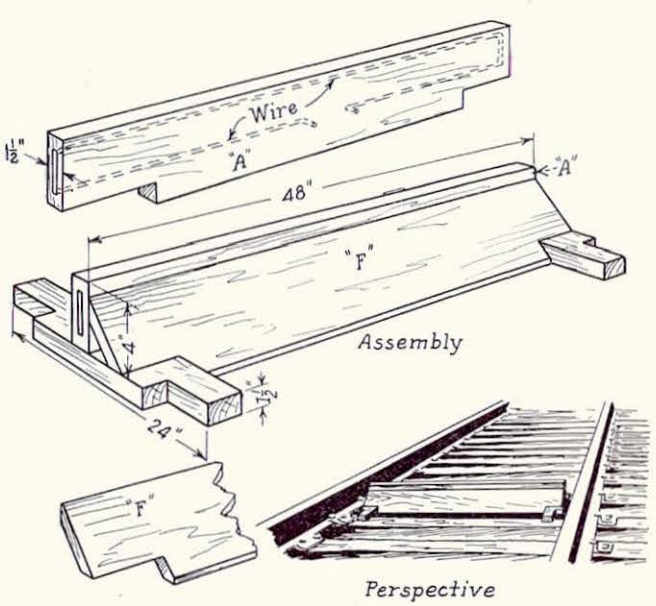
Without knowledge of the installation on the Lackawanna, the Pennsylvania, having experienced some accidents caused by dragging equipment, saw the need of a device to detect such faults, and W. M. Post, assistant chief signal engineer of that road, also developed a system of drag detectors, the first installation on that road being placed in service at Monmouth Junction, N. J., on March 4, 1936. This installation rendered such good service in detecting dragging brake rigging, faulty truck apparatus, etc., that three more installations were made and more are authorized. During the five years of service on the Lackawanna, the drag detector has rendered creditable service, and plans are under way for other similar installations. An explanation of the development and construction of the detectors as used on the two roads is given herewith.

Drag Detectors on the Lackawanna

A survey made by the Lackawanna indicated that approximately 70 per cent of the failures of car or truck parts caused trouble on descending grades, while 20 per cent were within 20 miles of large classification yards and the remaining 10 per cent were distributed elsewhere along the line. The first dragging equipment detector was installed on a descending grade at West Henryville, Pa., on April 22, 1931. The detector device consists of a 1½-in. by 5-in. by 48-in. plank mounted on edge transversely between the rails, a space of 4¼ in. being provided between each end of the plank and the adjacent rail to allow for passage of the car wheel flanges. The plank is bored lengthwise for a solid lead wire running approximately 1 in. below the top of the plank, then looping back through a hole near the bottom of the plank and extending to terminals at the center of the device.

The detector is so constructed that it is quite fragile when struck horizontally. However, a heavy vertical impact, such as would be caused by a dropped claw bar, power tamper, or other tool used by the road department, or a man stepping on the device was anticipated, and the device was constructed strong enough to resist such impacts.

Since it had been observed that a dragging part on a car had a tendency to hop or jump and to strike every



Drawing Showing the Details of the Construction of the Detector on the Lackawanna

third or fourth tie, the detectors originally installed consisted of four sections placed 1 ft. 8 in. apart along the track. The first installation also included elements installed outside the rails on each side, and the lead wires contained in all the elements in all sections were wired to form a continuous series circuit. From experience gained during actual operation, it became apparent that the failed car parts always contacted the first section regardless of whether they were low enough to strike the ties. Likewise, it appeared that, when the detector outside the rails was broken, the detector between the rails was also struck. For these reasons, the elements outside the rails were discontinued and one section was used instead of four.

It was also found that false detections resulted from hanging air or steam hose, which were not chained up, and from debris protruding from hopper cars. Such false detections were eliminated by the use of an apron on the approach side of the detector, consisting of a 1½-in. plank of the length of the vertical element, with beveled edges and notched so that it can be placed against the detector plank at an angle of 45 deg., thus serving as a ramp to deflect blows from minor sources. This apron also covers the terminals to which the circuit is connected.

Contacts on a relay, which is normally energized through the lead wire, are inserted in the controls of the next signal ahead of the point of installation in such a manner that the signal will provide a special aspect if dragging equipment breaks the lead wire. Based on the fact that defective equipment in a train might foul the adjacent track, instructions may also be issued to the effect that when a train is stopped by this special aspect, the fireman is to flag approaching trains on the adjacent track. For an installation of detectors in cab-signaling territory on multiple track, the circuits can be so arranged that detectors will control the cab signals on both tracks.

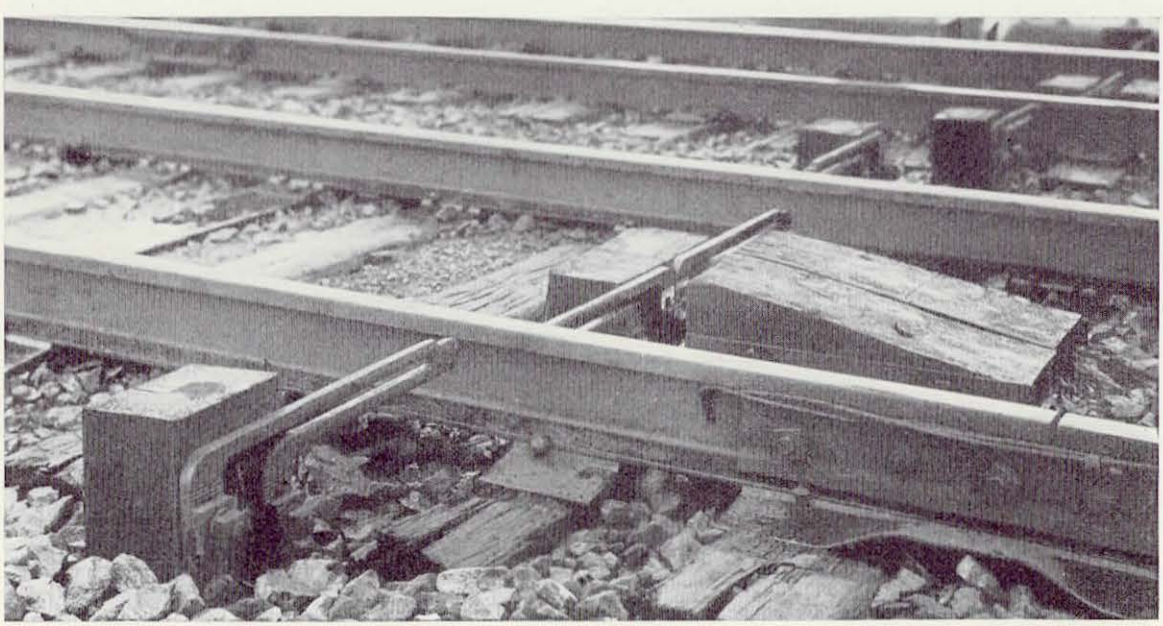
Pennsylvania Drag Detectors

The Pennsylvania has developed and installed at four locations, a system of detectors, the purpose of which is to give warning of the presence of damaged or loosened parts of locomotives or cars that may be hanging or dragging below the level of the top of the rail, and that might cause derailments when trains are running through switch layouts, such as those at large interlockings. In brief, the detector arrangement includes cast-iron arms mounted on each side of both rails and slightly below the top of the rail, the arms being connected in an electrical circuit in such a manner that the breaking of any one of the detectors causes the wayside signals as well as the locomotive cab signals to give warning to the engineman that he should stop the train.

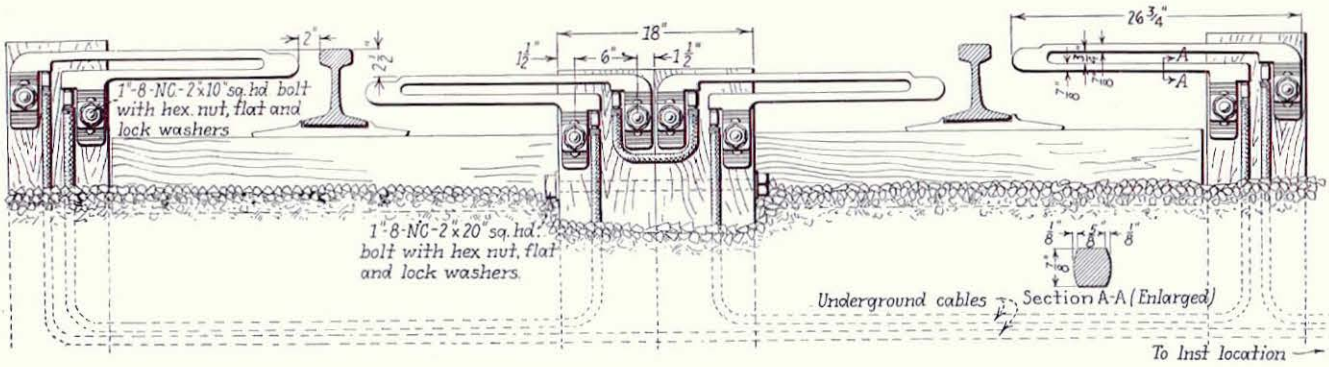
Experience has shown that in the majority of instances dragging equipment or defective trucks first cause trouble at switches because the turnout rail deflects the disarranged parts under the wheels, thus causing derailments. For this reason, the detectors in cab-signal territory are located approximately 8,000 ft. in the approach to interlockings. The detectors are in service on the four-track main line of the New York division between New York and Philadelphia, Pa., being located at the Midway, Nassau, Morris and Greene interlockings, 43, 48, 60 and 66 miles, respectively, west of New York. All of these are outlying interlockings, including numerous crossovers as well as junction and passing track switches. The majority of the operations are through movements at the maximum permissible speed. The normal traffic in this territory includes 175 passenger trains and about 64 freight trains daily. In this territory the two tracks on the south side, No. 1 and No. 2, are used by eastward trains and the other two tracks, No. 3 and No. 4, are used by westward trains. At each of these interlockings, as for example at Nassau, the detectors are located approximately 8,600 ft. in approach to the home signal of the interlocking.

Design of the Detector

The detector arrangement for each track consists of four bracket arms, one on each side of each rail, mounted in the areas most likely to be affected by dragging equipment. Each detector arm is ⅞ in. thick, 26¾ in. long and 2½ in. high. The two detectors inside the rails are mounted on a post in the center of the track, the devices being set so that the top edge of the detector is 2½ in. below the top of the rail. On each side of the track there is a separate post for mounting the detector outside the rail, these outside detectors being so set that the top is level with the top of the rail. All



The Cast-Iron Detector Arms As Used on the Pennsylvania Extend from Each Direction Toward the Rail


1"-8-NC-2"x10" sq. hd. bolt with hex. nut, flat and lock washers
1"-8-NC-2"x20" sq. hd. bolt with hex. nut, flat and lock washers
18"
6"
Underground cables
Section A-A (Enlarged)
To Inst location

Drawing Showing Details of Mounting of the Pennsylvania Detectors

four sections of the detectors are alike and they are, therefore, interchangeable.

Each of the posts on which the detector arms are mounted consists of a timber the size of a crosstie and four feet long. At the mounting end, each detector arm has flanges with saw-tooth faces which fit against matched surfaces of cast plates. Two 1-in. bolts pass through the tie, through the fixed plate, and through holes elongated vertically in the detector arm mounting, so that the position of the arm can be adjusted up or down in steps of ⅛ in.

These detector arms are grey iron castings made according to a specification that results in the casting being brittle, so that it can be broken by a blow from any piece of equipment hanging or dragging from a locomotive or car passing over the device. However, the castings are strong enough and are so mounted that they are not affected by rain, snow or ice, and are so rigid that they are not affected in the course of regular track maintenance.

Each detector casting is formed in the shape of a loop so as to be used from end to end as a part of a series electrical circuit. At each end of the loop, i.e., at the ends below the mounting plate, there is a ⅜-in. round, threaded lug, 2 in. long, extending downward. By means of a brass screw sleeve connector, a wire is connected to each end of the loop of each detector.

The circuit is so arranged that the four detectors for track No. 4 and the four detectors for track No. 3 are connected in series, and this circuit normally energizes a relay which controls circuits affecting the wayside and cab signals, as well as indicators above the operator's desk at the interlocking.

Operation of the System

If dragging or deranged equipment of a train breaks any section of one of the detectors, the relay drops, which effects several results. In cab-signal territory, the home signal and the two automatic block signals in approach thereto on the track affected, and the corresponding signals on the adjacent track used in the same direction of traffic, are set to display the "approach" aspect, providing they are not already displaying "approach" or a more restrictive aspect. Furthermore, the coded track feed for the cab signaling is cut off so that the cab signals in all locomotives in the area affected are so controlled as to display the "caution slow-speed" aspect.

The detectors are located far enough from an interlocking so that an engineman receiving such a change of aspects will have adequate time and space to stop his train before the defective part of the train reaches the interlocking. In view of the fact that defective equipment may exist in one of the cars toward the rear of a long freight train, the length of a train was taken as an additional factor in locating the detector devices. As a result of these considerations, the detectors are located from 8,500 to 9,000 ft. in advance of the home signal of the interlocking in cab-signal territory. Outside of cab-signal territory the detectors are located about 7,000 ft. in advance of the distant wayside signal. In order to utilize existing relay housing, line taps, etc., usually it has been found most practicable to locate the detectors at the second automatic signal location from the interlocking.

Meaning of Aspects Displayed

It should be noted that the operation of the detector device does not control the wayside signals to display a "stop" aspect in cab-signal territory, but rather an "approach" aspect. This practice was adopted because if the control were to effect a "stop" aspect, a train closely approaching a signal might suddenly have the aspect change from "clear" to "stop" without any approach warning, and as a result the engineman might make an emergency stop unnecessarily. The warning to the enginemen to stop their trains is, therefore, given by the cab signal rather than the wayside signal. The instruction with reference to the cab signals is to the effect that if the aspect of the cab signal changes from "clear" to "caution slow-speed" with the wayside signals at "approach," something unusual is wrong. Furthermore, the time-table special instructions explain in detail the location of these special detectors, with instructions to the effect that when the cab signal aspect changes to "caution slow-speed" in the territory where the detectors are in service, the engineman is to stop his train as soon as proper handling of the train will permit. Under these circumstances, the train is then inspected for dragging equipment, unless the operator informs the conductor that the special control has been set up by a detector being broken on another track. Outside of cab-signal territory, the detectors are connected so that the home signal displays "stop" when a detector is broken, the detectors being located a sufficient distance from the home signal so that an approach indication is received by the engineman. After the train stops at the home signal, it is held until an inspection can be made for dragging equipment.

Indication to the Operator

By means of indicators and information shown on the illuminated track diagram as to the position of the train or trains, the operator not only knows which train kicked off a detector, but can also estimate whether the defective car is toward the front or the rear of the train.

As a part of the detector system, a set of indicators is located above the operator's desk in the tower. As long as the detectors for the two westward tracks are intact, a small lamp on the indicator remains lighted.

When a detector is broken by dragging equipment, this lamp is extinguished and a small electrically-operated gong, with a special tone, is sounded, attracting the operator's attention. When the train has been stopped and a member of the crew reports to the operator by telephone, instructions are issued to inspect the train, providing only one train is involved and evidence indicates that defective equipment on that train has encountered a detector. In the meantime, a train being operated in the same direction on an adjacent track would encounter "approach" aspects on wayside signals and "caution slow-speed" aspects on the cab signals, and as a result would be brought to a stop to stay until authorized by the operator to proceed with caution past the standing train. Likewise, until the extent of the damage has been ascertained, the operator stops eastward trains on track No. 1 and No. 2 and instructs the enginemen to proceed with caution.

Having located the dragging equipment on the standing train, the necessary corrective measures are taken, or the car is set out. If, after a thorough inspection, no defects are located, this information is transmitted to the dispatcher, who can then instruct the operator to release the special detector control. This is accomplished by breaking a seal to open a box which contains a switch which, when operated, cuts out the detector control arrangement on the two tracks. The train is then authorized to proceed.

However, the special detector control is never out of service for an extended period, on account of being cut out by the operator. As soon as an indication is received that a detector is broken, the operator calls the signal maintainer, and as soon as the position of the trains will permit, the broken detector is replaced with a new one. About 10 min. time at the location is required to replace a detector. When the maintainer has completed the installation of the new detector, the entire arrangement is again in normal operating condition. Information to this effect is transmitted to the operator and forms a part of the report to the superintendent.

Benefits Effected by the Detectors

The first installation of these detectors was placed in service at the Midway interlocking near Monmouth Junction, N. J., on March 4, 1936, and the other installations have now been in service from three to six months. The results accomplished by the detectors have been decidedly satisfactory, so much so that installations at four more interlockings have been authorized.

Railroad Investments in Highway Transport

WASHINGTON, D. C.

CLASS I railroads on May 1, 1936, had a financial interest in 128 highway motor vehicle enterprises, according to a compilation made by the Bureau of Statistics of the Interstate Commerce Commission.

In the majority of cases the interest was indirect, through an intermediary company.

This compilation is based on returns made by Class I steam railways (excluding switching and terminal companies) in response to Statistical Series Circular No. 22, issued April 27, 1936. The returns were due July 1, 1936.

This abstract of the returns is arranged in three tables, which give respectively, (I) a list of the enterprises in which railways had a financial interest, directly or indirectly, as of May 1, 1936; (II) a statement of the financial transactions between the reporting railway and those highway motor vehicle enterprises for the year 1935; and (III) selected financial and operating data of the highway carriers involved.

The grouping by districts is in accordance with the arrangement of railway companies in the "Statistics of Railways", and not according to the territory covered by the highway carriers.

In each table the highway carriers are grouped under the headings, "Bus," "Truck", and "Unclassified", the last including station companies, lesser companies, and others for which sufficient information to permit of classification was not available. Companies operating both busses and trucks were classified according to the major source of their revenues.

The aggregate capitalization (par value) held by railways, or some intermediary, in these highway carriers was $43,109,361, as shown below:

Class of company	Stocks	Bonds	Advances	Total
Bus companies	$20,126,888	$7,161,067	$9,103,845	$36,391,800
Truck companies	4,149,601	190,450	1,259,840	5,599,891
Unclassified	837,006	126,500	154,164	1,117,670
Total	$25,113,495	$7,478,017	$10,517,849	$43,109,361

Of this total, railways in the Eastern district accounted for $20,087,576, or 46.6 percent; the Southern district for $612,176, or 1.4 percent, and the Western district for $22,409,609, or 52.0 percent. The relatively small amount in the Southern district is in part explained by the fact that the investments of the Chesapeake & Ohio are included under the head of "Erie R.R. Co., Pere Marquette Ry. Co., and Chesapeake & Ohio Ry. Co." assigned to the Eastern district.

The above totals are said to overstate the extent of the financial interest of the steam railways because they represent, not the investment by the rail carrier, but the capitalization of actual highway carriers regardless of the extent to which they are controlled by a railway or some intermediary. The railway's control of the intermediary may be by some percent other than 100. Thus, if Railway *A* has a 51 per cent control of holding company *B*, which has a 100 per cent control of highway carrier *C*, the entire capitalization of *C* is included in the above totals.

Question 2 of the circular required information as to whether any of respondent's directors or officers and assistants includible in Reporting Division No. 1 of monthly wage report as individuals has a financial interest in excess of $5,000 in any highway motor vehicle enterprise for the carriage of persons or property. Directors who are not employees are not covered by this inquiry. Only one carrier advised that a director had a substantial interest in a highway motor vehicle enterprise and information required had been requested of him. The tabulation was closed, however, without having received data concerning such holdings. The list of highway companies may also be incomplete from the fact that the chain of control may in some cases be of such an indirect character that respondents believed they might legally withhold the information. For example, the New York Central R. R. Co. did not report any interest in the United States Freight Company. It is not known how many other cases of this kind there may be. The Pennsylvania, in addition to the companies shown in Table I, stated that it had options on the stock of four other companies* through intermediaries.

The highway companies represented in Table I han-

(*Continued on page 730*)

* W. G. Corporation, Alko Express Lines, Chicago-Cincinnati Motor Freight Lines, and The Barker Motor Freight, Inc.

Suggestions for Locomotive Testing

Existing data should be critically analyzed before planning elaborate tests

By Lawford H. Fry

THE steam locomotive has been called one of man's most paradoxical machines. Many reasons might be given to justify this epithet. To the writer, one of the most valid is the fact that in spite of over eighty years of recorded tests and research, locomotive engineers are still in disagreement as to some of the fundamental principles of operation.

Interest is reviving in railroad transportation and the steam locomotive is receiving its share of consideration. It seems opportune, therefore, to call attention to an anomalous situation. In many cases, failure to agree on fundamental principles is not due to lack of experimental work. It must be blamed on insufficient assimilation of information already available.

An extensive program of locomotive tests has been proposed. If these are to be valuable, they should be preceded by careful consideration of the many tests that have been made already. There is great need of systematic study of extensive locomotive test data which have been already accumulated. In the interest of further progress it is important that this study be directed to establishing a general theory of locomotive operation. The process by which the energy in the coal fired is transformed to produce transportation needs to be broken down into a series of relatively simple processes, which can be studied individually. A large amount of locomotive testing has been done, and much reliable data are on record. The data now available are sufficient to show the general pattern into which the individual processes of locomotive operation must fit.

Progress may easily be hampered by failure to agree on the pattern of the processes to be studied. For example: A series of tests has been proposed, applying cylinders of various dimensions under the same boiler, to study the effect of varying locomotive proportions. This proposal fails to take into account the lessons that should have been learned from earlier tests. In stationary power plants it is not considered to be necessary to combine a test of the steam turbine with a boiler test.

Boiler and Cylinders Should Be Considered Separately

If there is one principle in locomotive engineering which should have been clearly demonstrated by earlier experiments, it is that the steam producing and the steam consuming functions of the locomotive can and should be studied separately. Boiler and cylinders are not an inseparable unit. The capacity of the boiler limits the power that can be taken from the cylinders. Otherwise, the two are almost entirely independent. Recognition of this fact is surprisingly incomplete in view of the experimental evidence available. M. N. Forney, in his classic, Catechism of the Locomotive, in 1875 wrote: "It may, therefore, we think, be safely assumed that locomotive boilers should always be made as large as the weight of the locomotive will permit."

This early authority recognized that the production of the steam did not depend on the dimensions of the cylinders through which the steam eventually passed. So far as operation and efficiency of the boiler are concerned, the cylinders play no more than the part of a throttle controlling the rate at which the steam is exhausted to the atmosphere. The exhaust through the smokebox provides the draft which permits the production of the steam, but speed and cut-off do not affect the operation and efficiency of the boiler. Evidence to this effect is abundant.

The writer has published in the last twenty-five years analyses of a large number of locomotive boiler tests. All of these can be quoted in support. The same is true of the work on locomotive front-ends carried out by the Engineering Experiment Station of the University of Illinois. Prof. Davidson, in discussing Young and Pei's 1934 A.S.M.E. paper, summed up the situation clearly and presented a convincing plot of a series of tests from the Pennsylvania Railroad testing plant. Finally, we quote Mr. André Chapelon, who, in describing an elaborate series of tests on the Paris-Orleans-Midi, expresses the opinion that boiler efficiency is not affected by the conditions under which the cylinders operate.

The evidence that boiler and cylinders can be tested and studied as separate entities seems to be conclusive. If this is recognized, any future program of tests can be made simpler and more effective.

Boiler Heating Surface and Firebox Capacity

Another point should receive careful attention before further test programs are planned. It may be emphasized by saying that the area of the boiler heating surface has relatively little effect on the capacity of a locomotive. Put in this form, the statement will doubtless be questioned. Evidence in support can be found, however, in a large number of tests made with locomotives of widely varying types and designs. Analysis of the tests will show that the heating surface, irrespective of size or proportions, is a device of almost constant efficiency. In all locomotive tests in which the present writer has been able to strike a heat balance it has been found, with but a few per cent variation either way, that the heating surface absorbs approximately 83 per cent of the heat actually produced in the firebox. This holds for locomotives as dissimilar as the Purdue experimental 4-4-0, the Pennsylvania Mountain type and a modern French locomotive with Serve ribbed flues and a Houlet superheater. It also holds for all rates of firing from the lowest to the highest possible.

The available test data show that in no test, even at the maximum output, did the heating surface absorb appreciably less than 77 per cent of the heat offered to it; nor at the lowest output was more than 87 per cent absorbed. The over-all boiler efficiencies varied from about 50 to 80 per cent. It is very evident from these figures that the steaming capacity of a locomotive boiler is never limited by failure of the heating surface to be able to absorb heat. It is limited only by the capacity of the fire-

box to produce heat. This capacity depends on the quality of the fuel, on the design and dimensions of the grate and on firebox volume.

Relationship Between Fuel and Firebox Volume

From this it follows that new locomotive tests, to measure the effect of varying relationships between cylinder dimensions and area of heating surface, would have little if any value. Before any such tests are undertaken, the existing data should be analyzed. Such analysis would establish on a firm basis the fact that area of heating surface has, in itself, little to do with the ability of the boiler to produce steam. The analysis would also show that the relationship between the type of fuel and the firebox design is the controlling factor in setting the capacity of a locomotive boiler. It would further show that quantitative information on the subject is extremely meager. Something is known about the necessity for grate area, but the importance of firebox volume has not received much attention.

It is, of course, well known that non-coking coals, such as fine anthracite and the semi-lignites of the Northwest can be burned efficiently only at low rates of firing. Large grate areas are needed. For the coking coals, smaller grates and higher rates of firing can be used. For such coals, with a high proportion of volatile matter, firebox volume is undoubtedly of importance. Existing test data will yield little which can be used quantitatively. Knowledge of the chemical and physical characteristics of a coal is not sufficient for the design of a firebox to burn the coal to the best advantage. Two coals having the same analysis and heating values, but differing in coking characteristics, may give quite different results when fired in the same firebox. In tests of the Paris-Orleans-Midi locomotive referred to above, two coals were used, differing only in their coking capacities. Loss of coking capacity by being a longer time in storage reduced the over-all boiler efficiency from 66 per cent to 60 per cent for the same rate of firing. The relation between fuel and firebox offers a wide field for future research.

Analyze and Collate Existing Data

The main purpose of this article is not, however, to suggest further test work, but to urge the desirability of first analyzing existing data. In this way only can future tests be intelligently directed to secure information which is now missing. The aim should be to establish a general pattern of the vital processes of the locomotive. With this done, further testing can be planned in relation to the whole science, rather than as a test of an individual locomotive.

In dealing with the cylinders, the available data relating steam consumption and power to cut-off and speed would yield valuable information if properly correlated with design characteristics. Certain general principles can be established from existing data and used as a basis for laying out a further program for research.

It can probably be shown as a general rule that the cylinder tractive force for a given cut-off falls off in a straight-line relation as the speed is increased. This drop in power is due to the increased difficulty in getting steam into and out of the cylinders. It is not thought that any basic relation between cylinder force, speed and cut-off can be developed. Probably, however, study of existing data will show a general pattern for the relation, which will be of reasonably universal application. A brief survey shows that a pattern of this sort holds for American single-expansion locomotives and for the French four-cylinder compound. If a relationship of this sort is found to be generally applicable, it should be of great value in comparing the efficiency of cylinder designs. The cylinders which show the least drop in tractive force as speed increases will develop the most power from each cylinderful, or, more exactly, from each cubic foot of steam, and will thus be the most efficient.

The writer is convinced that there are great possibilities for improvement and economy in the steam locomotive, and that the way to these is through extended testing. It is certain that for such test work to have its full value the existing data should be analyzed and collated, and that general agreement should be reached as to the principles which underlie locomotive operation.

Railroad Investments in Highway Transport

(*Continued from page 728*)

dled in the calendar year, 1935, 2,619,786 tons of freight in line haul operations and 1,973,513 tons in local drayage operations. They carried 107,727,485 passengers in line haul operations.

Financial Results

Table II shows that the Class I steam railways received, during the calendar year, 1935, $3,530,899 as dividends or interest, $328,704 as repayment of advances, and $1,124,175 as rents or other payments, a total of $4,983,778. The dividends of $3,530,899 amounted to 55.3 per cent of the total dividends declared by the highway companies. The advances and other expenditures made by the railways directly or indirectly were $6,982,610, some of which represents new investments, but most of it is payment for pick-up and delivery, line haul service, or advances.

Table III gives, for the calendar year 1935, a selection of items from the income accounts and balance sheets of 128 highway motor vehicle enterprises in which railways had a financial interest as of May 1, 1936. The total assets amounted to $89,508,108, of which $59,231,728 was in plant and equipment. There was accrued depreciation of $23,762,239. The corporate deficit at the close of 1935 shown in Table III was $9,136,442, but if the deficit of the Berkshire Street Railway Company, which has resulted largely from electric railway operation, be excluded, there was a surplus of $5,074,060. Of the total assets, bus companies hold 82.40 per cent, truck companies 15.70 per cent, and other companies 1.90 per cent. The net income after taxes and interest was $8,593,063, of which 87.18 per cent was that of bus companies. The bus companies declared dividends of $5,490,486, the truck companies $914,166. Bus companies had operating revenues amounting to $73,482,794 and truck companies had revenues of $52,904,587.

The Railway Express Agency, Inc. and Southeastern Express Company, which are important highway carriers, are not covered by this tabulation. At the close of 1935, they owned 8,167 gasoline and 1,230 electric highway motor vehicles. They file complete annual reports with the Interstate Commerce Commission.

THE SOIL IMPROVEMENT CAR operated by the Nashville, Chattanooga & St. Louis and the University of Tennessee recently completed its 1936 tour of the former's lines. In the course of the tour stops were made at 17 points where lime and phosphate tests were made of samples of soil supplied by 341 farmers.

NEWS

"Rubber-neck" Bus Idea Tried on Excursion Train

Central of New Jersey sight-seeing trip includes lecture on points of interest

The Central of New Jersey operated a new kind of sight-seeing trip on Sunday, November 8, when it equipped a five-car excursion train with a public announcer system whereby B. D. Branch, general passenger agent, was able to deliver a lecture and point out interesting places en route. Despite the unfavorable weather, this adaptation of the "rubber-neck" bus idea to the rails attracted 121 revenue passengers who were virtually unanimous in pronouncing the day a most enjoyable one and in calling for more similar excursions. The train covered 325 mi. at a fare of $3.25, leaving New York at 9:00 a.m. and arriving back there at 8:09 p.m.

Considerable preparation for this lecture excursion was necessary, but Jersey Central passenger traffic officers feel that the initial response amply repaid their efforts. When the idea was developed Mr. Branch consulted the Audio Engineering Corporation of New York, and that company, having pronounced the plan feasible, installed the loud speakers—one in each car—by running wires along the car roofs and in through the ventilators. The microphone for Mr. Branch was set up in the baggage compartment of the combination baggage car and smoker at the front end of the train. This apparatus was placed at a table in the center of the car and between the two doors which were left open to give the lecturer a view of both sides of the track. In addition Mr. Branch had assistants stationed at each door to inform him as points of interest were being approached.

The lecture was prepared with the cooperation of chambers of commerce of towns and cities through which the train passed, and important industries along the line. The route of the train was from New York to Bound Brook, N. J., and westward to Mauch Chunk, Pa., where a stop was made before swinging down to Pottsville and thence eastward through Reading to Valley Forge, where a second stop of one hour permitted patrons to visit points of historic interest which had been described in the lecture as the train approached the town. From Valley Forge the train proceeded to Philadelphia and then to New York.

At various points in the lecture, when the train was passing through territory requiring no particular comment, Mr. Branch worked in brief histories of the Central of New Jersey, the cement and coal industries and the Lehigh Canal; he announced the names and service records of the train crew and, in passing through C. N. J. yards at Jersey City, he pointed out how famous C. N. J. and Baltimore & Ohio trains use these facilities. Also, he had the dinner gong before him to announce the hours of meals in the diner, where six breakfasts, 84 lunches and 27 dinners were served.

Representatives of the road contacted all passengers and received favorable comments on the idea from virtually all of them. It is therefore the C. N. J. plan to develop the idea further next Spring, when plans for such trains can be made with prospects for more favorable weather.

Annual Meeting Freight Claim Division To Be Held at Toronto

The annual meeting of the Freight Claim Division of the Association of American Railroads will be held at the Royal York hotel, Toronto, Ont., on June 15, 16 and 17, 1937.

Henry C. Hall, Former Member of I.C.C., Dies

Henry Clay Hall, a member of the Interstate Commerce Commission from 1914 to 1928, died at Ashfield, Mass., on November 9, after a short illness, at the age of 76. He was appointed to the commission by President Wilson in 1914 and resigned in 1928 to engage in the practice of law at Washington, D. C.

Railroad Enthusiasts

"New Haven Night" is announced by the New York Division, Railroad Enthusiasts, Inc., for Friday, November 20, at 7:45 p.m., in Room 2726, Grand Central Terminal, New York. Motion pictures of the New Haven snow-trains, bicycle-trains, etc., will be shown; a passenger and an operating officer of the railroad will speak and something is also promised in the nature of a surprise.

Western Rails to Continue Low Fares For 1937 Vacationists

The reduced round-trip sleeping car fares to Colorado, the Black Hills, the National Parks and the Southwest, including Arizona and New Mexico, ranging from 1⅓ cents to 2 cents a mile, which were in effect this year on western lines, will be placed in effect again during the 1937 summer season. At the same time the 16-day return limit will be increased to 21 days. The same rates on first class and coach travel will also apply to travel to the lake and woodland regions of Wisconsin, Minnesota and northern Michigan.

Truckers Ask Injunction Against Storedoor Tariffs

A.T.A. application in Washington is followed by other petitions filed in New York

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Other current research activities include those being conducted at the University of Illinois by the railroads and steel manufacturers to determine what further improvements can be made in the method of rolling steel rails; those of the A.A.R. Engineering section on the advantages of continuous welding of rails; motive power efficiency studies of railroads and locomotive builders; experiments of individual roads, the A.A.R. and car builders to determine the extent to which steel alloys are practical for passenger and freight cars; experiments of manufacturers in connection with fusion welding of tank cars; studies designed to improve brake shoes; the draft gear tests at Purdue University; studies of wire and radio communication; activities of the Freight Container Bureau to develop improvements in packing and crating; studies of standardization of materials with a view to reducing stocks on hand; the work of the A.A.R. Bureau of Explosives laboratory at South Amboy, N. J.; the A.A.R.'s continuing contributions of funds for studies of stresses in railroad track.

In connection with the co-ordination studies it was pointed out that 48 have been completed, 10 of which are now being put into effect. In addition, 673 projects are being re-examined in the light of changed labor and traffic conditions. These projects will be disposed of as rapidly as possible. Many of these, it was pointed out, involve an immense amount of work, including elaborate engineering surveys as well as comprehensive and detailed studies of traffic conditions, operating costs, and other subjects which must be carefully considered before any conclusion can be reached as to their practicability. These studies are being made in compliance with a resolution adopted by the A.A.R. board of directors after the agreement had been reached between railroads and labor for

NEWS

"Rubber-neck" Bus Idea Tried on Excursion Train

Central of New Jersey sight-seeing trip includes lecture on points of interest

The Central of New Jersey operated a new kind of sight-seeing trip on Sunday, November 8, when it equipped a five-car excursion train with a public announcer system whereby B. D. Branch, general passenger agent, was able to deliver a lecture and point out interesting places en route. Despite the unfavorable weather, this adaptation of the "rubber-neck" bus idea to the rails attracted 121 revenue passengers who were virtually unanimous in pronouncing the day a most enjoyable one and in calling for more similar excursions. The train covered 325 mi. at a fare of $3.25, leaving New York at 9:00 a.m. and arriving back there at 8:09 p.m.

Considerable preparation for this lecture excursion was necessary, but Jersey Central passenger traffic officers feel that the initial response amply repaid their efforts. When the idea was developed Mr. Branch consulted the Audio Engineering Corporation of New York, and that company, having pronounced the plan feasible, installed the loud speakers—one in each car—by running wires along the car roofs and in through the ventilators. The microphone for Mr. Branch was set up in the baggage compartment of the combination baggage car and smoker at the front end of the train. This apparatus was placed at a table in the center of the car and between the two doors which were left open to give the lecturer a view of both sides of the track. In addition Mr. Branch had assistants stationed at each door to inform him as points of interest were being approached.

The lecture was prepared with the cooperation of chambers of commerce of towns and cities through which the train passed, and important industries along the line. The route of the train was from New York to Bound Brook, N. J., and westward to Mauch Chunk, Pa., where a stop was made before swinging down to Pottsville and thence eastward through Reading to Valley Forge, where a second stop of one hour permitted patrons to visit points of historic interest which had been described in the lecture as the train approached the town. From Valley Forge the train proceeded to Philadelphia and then to New York.

At various points in the lecture, when the train was passing through territory requiring no particular comment, Mr. Branch worked in brief histories of the Central of New Jersey, the cement and coal industries and the Lehigh Canal; he announced the names and service records of the train crew and, in passing through C. N. J. yards at Jersey City, he pointed out how famous C. N. J. and Baltimore & Ohio trains use these facilities. Also, he had the dinner gong before him to announce the hours of meals in the diner, where six breakfasts, 84 lunches and 27 dinners were served.

Representatives of the road contacted all passengers and received favorable comments on the idea from virtually all of them. It is therefore the C. N. J. plan to develop the idea further next Spring, when plans for such trains can be made with prospects for more favorable weather.

Annual Meeting Freight Claim Division To Be Held at Toronto

The annual meeting of the Freight Claim Division of the Association of American Railroads will be held at the Royal York hotel, Toronto, Ont., on June 15, 16 and 17, 1937.

Henry C. Hall, Former Member of I.C.C., Dies

Henry Clay Hall, a member of the Interstate Commerce Commission from 1914 to 1928, died at Ashfield, Mass., on November 9, after a short illness, at the age of 76. He was appointed to the commission by President Wilson in 1914 and resigned in 1928 to engage in the practice of law at Washington, D. C.

Railroad Enthusiasts

"New Haven Night" is announced by the New York Division, Railroad Enthusiasts, Inc., for Friday, November 20, at 7:45 p.m., in Room 2726, Grand Central Terminal, New York. Motion pictures of the New Haven snow-trains, bicycle-trains, etc., will be shown; a passenger and an operating officer of the railroad will speak and something is also promised in the nature of a surprise.

Western Rails to Continue Low Fares For 1937 Vacationists

The reduced round-trip sleeping car fares to Colorado, the Black Hills, the National Parks and the Southwest, including Arizona and New Mexico, ranging from 1⅓ cents to 2 cents a mile, which were in effect this year on western lines, will be placed in effect again during the 1937 summer season. At the same time the 16-day return limit will be increased to 21 days. The same rates on first class and coach travel will also apply to travel to the lake and woodland regions of Wisconsin, Minnesota and northern Michigan.

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dismissal compensation for employees displaced by co-ordinations of facilities and services on two or more railroads. Under this resolution, committees representing the Eastern, Western and Southern regions were appointed to consider these various projects.

Of the 48 projects on which studies have been completed, it was found in eight cases that a portion of the facilities proposed to be consolidated have since been abandoned with economies greater than were contemplated by co-ordination. Twenty-seven projects were found to be impracticable either because no economy would result from co-ordination under present conditions, or the savings would be too small to warrant action. In several instances it was found that, since the projects were listed originally for study, the increase in railroad business has made co-ordination of facilities unwarranted. In the case of three projects, final action was deferred.

The ten projects which have been approved and are being made effective follow:

Union Pacific abandoned 71 mi. of its line between Ainsworth, Ore., and North Junction, and is making joint use of the parallel line of the Oregon Trunk Railway.

Chicago, Rock Island & Pacific is to abandon its line between Anthony, Kan., and Ingersoll, a distance of 33 mi., and will make joint use of the Atchison, Topeka & Santa Fe in that territory.

Due to the fact the New York Central and the Erie had parallel lines between Batavia, N. Y., and Attica, an agreement was reached whereby the New York Central will abandon its facilities and make joint use of those of the Erie.

Between Albia, Iowa, and Tracy, a distance of 19½ mi., facilities on the parallel lines of the Wabash and the Chicago, Burlington & Quincy have been pooled. Under that agreement, the Wabash will abandon eleven miles of line and the Burlington will abandon eight miles of line. These two roads will then make joint use of the remaining facilities.

Between Red Wing, Minn., and Cannon Falls, the Chicago, Milwaukee, St. Paul & Pacific is to be abandoned and, in its place, the Milwaukee and the Chicago Great Western will make joint use of the latter's line.

Joint use of station facilities at Valliant, Okla., by the St. Louis-San Francisco and the Texas, Oklahoma & Eastern has been placed in effect.

Joint agency establishment at Alhambra, Ill., by the Illinois Central and the New York, Chicago & St. Louis, the latter road having closed its separate agency at that point.

Between Eunice, La., and Mamou, the Texas & New Orleans abandoned its line which paralleled that of the Chicago, Rock Island & Pacific.

Freight stations of the New York, New Haven & Hartford and the New York Central System at Brewster, N. Y., consolidated.

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Members of the A.A.R. board of directors elected for the coming year are as follows: M. W. Clement, president, Pennsylvania; C. E. Denney, president, Erie; E. S. French, president, Boston & Maine; Daniel Willard, president, Baltimore & Ohio; F. E. Williamson, president, New York Central; L. W. Baldwin, chief executive officer, Missouri Pacific; S. T. Bledsoe, president and chairman of Executive committee, Atchison, Topeka & Santa Fe; C. R. Gray, president, Union Pacific; Hale Holden, chairman, Southern Pacific; W. P. Kenney, president, Great Northern; H. A. Scandrett, trustee, Chicago, Milwaukee, St. Paul & Pacific; L. A. Downs, president, Illinois Central; George B. Elliott, president, Atlantic Coast Line; J. B. Hill, president, Louisville & Nashville.

Required Date For Filing Truck Contracts Postponed

The Interstate Commerce Commission, Division 5, has postponed from December 1 to February 1, 1937, the effective date of its order of July 11 requiring contract carriers by motor vehicle to file with the commission and keep open for public inspection copies of their contracts, and memoranda covering oral contracts, in lieu of schedules of their charges.

Seattle-Chicago Schedules Speeded Up

Beginning November 15, 45 minutes will be cut from the running time of the Olympian of the Chicago, Milwaukee, St. Paul & Pacific, and the Empire Builder of the Great Northern, between Seattle and Chicago. With a 45-min. later departure from Seattle, the Olympian will leave at 10:30 p.m. and the Empire Builder at 10:15 p.m. They will arrive in Chicago at the same time as at present, 8:55 a.m. and 8:40 a.m. on the third morning, respectively.

Large Truck Merger Proposed

Merger of three trucking companies into one company operating truck lines extending from New York to Kansas City and serving the principal intermediate cities is proposed in an application filed with the Interstate Commerce Commission by the Transamerica Freight Lines, Inc., of Delaware, the Transamerica Freight Lines, Inc., of Michigan, and the Triangle Motor Freight Forwarding Company, of Detroit, Mich. The company also proposes to issue $525,000 of capital stock.

Ports on the Upper Hudson River

The Board of Engineers for Rivers and Harbors, War Department, announces the publication of a new report covering the ports on the upper Hudson river, which is issued as No. 25 of the Port Series. The present report covers the ports of Albany, N. Y., Troy, Rondout Harbor, Poughkeepsie, Newburgh, Tarrytown, and Yonkers, giving information with regard to port and harbor conditions; port customs and regulations; services and charges; fuel and supplies; and the facilities available for service to commerce and shipping, including piers, wharves, grain elevators, storage warehouses, bulk freight storage, dry docks and marine railways, marine repair plants, floating equipment and wrecking and salvage facilities. Railroad and steamship lines serving the ports are discussed and their charges and practices in connection with terminal service. Tables are presented showing the commerce at the various ports, and information is given showing the origin of imports at Albany in 1934 and the destination of exports.

Embargoes on Port Traffic

Walkouts of ship crews in eastern and gulf ports and a tie up of shipping on the west coast reached a state on November 2 wherein it became necessary for the railroads to place embargoes on traffic moving to ports for shipment beyond. For the first few days, embargoes were placed on traffic moving to individual steamship lines whose labor difficulties interfered with ship departures. Later, as the trouble became more general, the embargoes were applied to almost all railroads serving ports where shipping was tied up.

State Failure to Permit Emergency Charges Found Not Discriminatory

The Interstate Commerce Commission has dismissed its proceeding of investigation into the failure of the North Carolina Utilities Commission to permit the continuance of the emergency freight charges after July 1, when they were extended for another six months' period as to interstate traffic, finding that the railroads had not made a showing that the lower state rates would result in undue preference or prejudice or undue, unreasonable, or unjust discrimination against interstate commerce.

Illinois Central Radio Advertising

The Illinois Central, on November 22, will resume radio advertising of winter travel when a 13-week Sunday evening series will be undertaken. This will be the third consecutive season on the air for the programs known as "Headin' South." They will be broadcast from nine stations in the upper Mississippi Valley. The announcer will be Norman Ross, who is the announcer on the Illinois Central Chicago suburban service hour, which is broadcast from station WMAQ, Chicago, every weekday morning from 7 to 8 o'clock.

Railway Employment up 9 Per Cent in Year

Class I railroads, excluding switching and terminal companies, have reported to the Interstate Commerce Commission a total of 1,109,448 employees as of the middle of the month of October. This was an increase of 9.11 per cent over the number in October, 1935, and an increase of .71 per cent as compared with September this year. The number of maintenance employees had increased over 11 per cent in a year. The commission's preliminary compilation gives an index number for railway employment in October of 62.1 per cent of the average for the years 1923-1925.

Evening Study Courses for Employees of British Roads

Two British railways—the London, Midland & Scottish and the Great Western—have recently inaugurated a series of eve-

ning classes for their employees. These courses, which are provided free, include lectures on signaling, traffic, operating and economic subjects, and the records of employees attending are entered on their service records with the railroad.

These classes are a development of the national educational campaign on railway service, needs and aims which was launched by the British railways last year when more than 40,000 school children attended instructions in trains touring the country.

Illinois Central Fire-Fighting Locomotives

The Illinois Central has just completed the equipping of 350 switching locomotives with fire-fighting apparatus as an added measure for safety and protection of property. The equipment consists of a reel or box of specially treated cotton rubber-lined hose, a nozzle and connections with the water tank and locomotive injector, which can develop a nozzle pressure up to 150 pounds.

"Edison Night" at New York Railroad Club

The next meeting of the New York Railroad Club, to be held on Friday, November 20, at 7:45 p.m. in the auditorium of the Engineering Societies building, 29 West 39th street, New York, will be "Edison Night." Various phases of Thomas A. Edison's life and achievements will be discussed by the following officers of Thomas A. Edison, Inc.: C. S. Williams, Jr., executive vice-president; Arthur Walsh, vice-president; Nelson C. Durand, vice-president and division manager, Ediphone division; George E. Stringfellow, vice-president and division manager, Edison Storage Battery division; and R. E. Trout, vice-president, Primary Battery division. This November 20 meeting will also be the club's annual meeting at which the election of officers will take place.

R. B. A. Annual Meeting

At its anual meeting in New York on November 5, the Railway Business Association re-elected its officers and executive committee, and appointive officers were re-appointed. Three new members were added to the governing board as follows: Carl C. Gibbs, president, National Malleable & Steel Castings Co.; N. J. Clarke, president, Republic Steel Corporation; J. H. Rodger, Oxweld Railroad Service Company.

At the annual dinner, preceding the address of Dr. H. G. Moulton (reported elsewhere in this issue), President Harry A. Wheeler reviewed briefly the success of the program of the association in promoting the study of the probable effects of government ownership on the railroad industry—and the great volume of public sentiment against such an eventuality which has thereby been developed.

Engineering Foundation Elects Officers

Frank Malcolm Farmer, vice-president and chief engineer of the Electrical Testing Laboratories, New York, has been elected chairman of the Engineering Foundation. This research organization, which is associated with the national engineering societies, was organized a number of years ago through the generosity of Ambrose Swasey, of Cleveland, Ohio. Mr. Farmer is a past president of the American Society for Testing Materials and of the American Welding Society. Dr. Robert Yarnall of the Yarnall-Waring Company, Philadelphia, was re-elected vice-chairman, and Dr. Alfred D. Flinn continues as director and secretary. The executive committee includes Otis E. Hovey of the American Bridge Company; A. L. J. Queneau, metallurgist of the United States Steel Corporation, and Prof. Walter I. Slichter of Columbia University.

I.C.C. Asks Special Accident Reports for Another Year

The Interstate Commerce Commission has amended its order of October 24, 1935, requiring the keeping of a special record of accidents to employees and a monthly report of such accidents, by extending the period for the recording and reporting of such accidents to include the calendar year 1937, and thereafter until otherwise ordered. It was further ordered that beginning with the first day of January, 1937, all carriers within the scope of the accident reports act shall include in their monthly reports of railway accidents an additional statement of the total number of employees on duty injured whose cases are not now reportable on the basis of disability beyond the day, or shift, during which the accident occurred but who suffer an amputation, fracture, impairment of vision, or any permanent injury, or any injury requiring the use of splints or crutches, such total to be subdivided among the following classes: train, train-service, and non-train accidents.

Denver Zephyrs Placed in Daily Service

The Denver Zephyrs of the Chicago, Burlington & Quincy were placed in daily service between Chicago and Denver, Colo., on November 8. Prior to the departure of the Zephyr from Chicago, on its first run, christening ceremonies were broadcasted over station WMAQ. Walter Dill Scott, president of Northwestern university, Evanston, Ill., participated in the program, in recognition of the part that John Evans played both in the development of Colorado as second territorial governor, and in the establishment of Northwestern university in Evanston, which city was named after him, and Colorado university. A. Cottsworth, Jr., passenger traffic manager of the Burlington, was the second speaker. The train was christened by Jane Garlow, granddaughter of Wm. F. Cody (Buffalo Bill), who approached the train on horseback and broke a bottle of champagne on the nose of the train. After these ceremonies the radio announcer passed through the train and described its interior.

The train which left Denver on November 8 was christened on October 24, when addresses were made by Mayor B. F. Stapleton of Denver; Col. Banks, representing the governor's office; and Ralph Budd, president of the Burlington; and Miss Garlow christened the train with champagne. These ceremonies were broadcasted over station KOA.

The Denver train leaving on November 8, carried the winners of the Silver Queen contest, conducted by the Denver Post of the American Legion. The queen and her court of honor of four were awarded complete wardrobes and a trip to Chicago on the first run of the Denver Zephyr.

Many Shippers Oppose Proposed Freight Rate Readjustment

Over 200 protests had been made public by the Interstate Commerce Commission by Tuesday of this week of those received by November 7 against the proposals of the railroads to substitute a readjustment of freight rates including a large number of increases for the emergency charges which are due to expire on December 31. The railroads had asked the commission to modify its outstanding orders in approximately 1,000 cases to permit them to file new tariffs intended to preserve much of the revenue they have been deriving from the "surcharges." The National Coal Association and the consumers' council for the National Bituminous Coal Commission accompanied their protest with a petition for a general investigation by the commission of all interstate bituminous rates, asserting that the railroad petition "constitutes the opening move by the railroads in a third attempt during the past two years to saddle a permanent rate increase amounting to at least $30,000,000 per annum upon the depressed bituminous coal industry." Most of the protests took the position that permanent rate increases would divert shipments to truck transportation.

March Supply Exhibit to Exceed That of Last Year

At a meeting of the board of directors of the National Railway Appliances Association at Chicago on November 5, applications for space were received from 77 companies for the exhibit to be held in the Coliseum, Chicago on March 15-18, 1937, during the conventions of the American Railway Engineering Association and the Signal Section, A. A. R. With the larger exhibits which a number of companies are planning, the demand for space is already 50 per cent larger than last year, as a result of which the exhibit will fill the North Annex as well as the main hall of the Coliseum. The companies which have contracted for space follow:

Adams & Westlake Co.
Air Reduction Sales Co.
American Car & Foundry Co.
American Fork & Hoe Co.
American Hoist & Derrick Co.
Armco Culvert Mfrs. Association
Austin-Western Road Machinery Co.
Barco Manufacturing Co.
The Barrett Co.
Bethlehem Steel Company
The Buda Company
Chicago Pneumatic Co.
Chipman Chemical Co.
Cleveland Frog & Crossing Co.
Cleveland Tractor Co.
Conley Frog & Switch Co.
Crerar, Adams & Co.
Cullen-Friestedt Company
A. P. DeSanno & Son
Paul Dickinson, Inc.
Duff-Norton Mfg. Co.
Eaton Manufacturing Co.
Elastic Rail Spike Corp.
Electric Tamper & Equipment Co.
Evans Products Co.
Fairbanks, Morse & Co.

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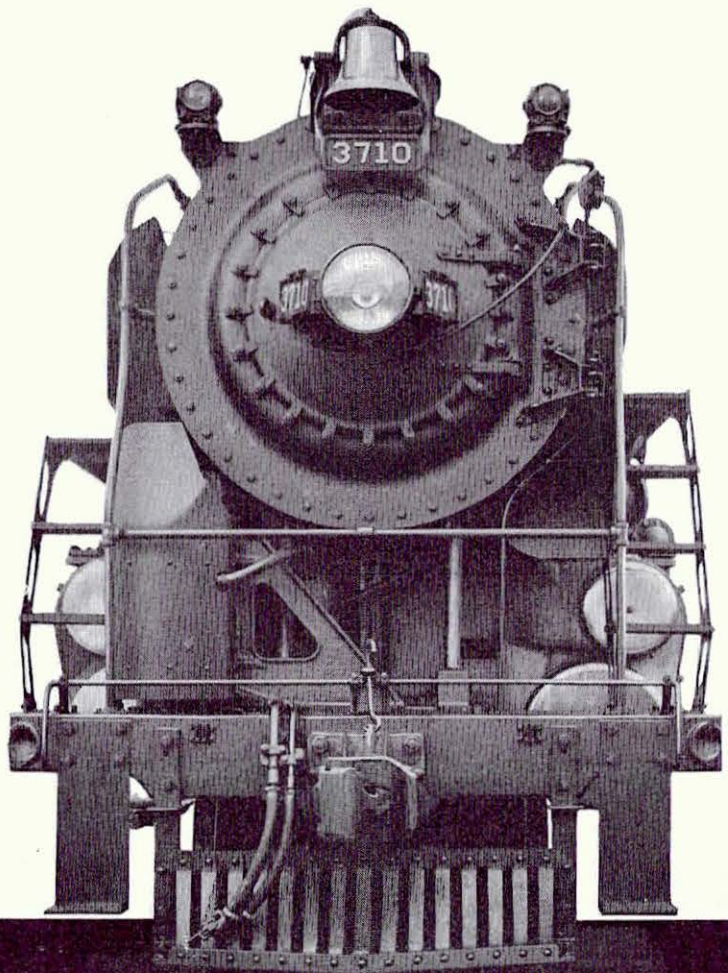
MODERN POWER
Is the Key to Net Profits



Higher mathematics are not needed to determine the advantages of modern power.

Modern power uses less coal per 1,000 ton-miles, it moves more tons per train and it moves capacity trains at faster average speeds between terminals.

It makes greater use of every railroad facility. It gets its train over the road so the following train can use the rails.

It is more economical to operate and costs less to maintain.

Modern power, in every case, shows increased net earnings and yields a handsome return on the investment.

LIMA LOCOMOTIVE WORKS INCORPORATED

LIMA LOCOMOTIVE WORKS INCORPORATED, LIMA, OHIO

Fairmont Railway Motors, Inc.
Fansteel Metallurgical Co.
General Electric Co.
Hayes Track Appliance Co.
Hubbard & Co.
Ingersoll-Rand Co.
Industrial Brownhoist Corp.
Johns-Manville Sales Corp.
O. F. Jordan Co.
Joyce-Cridland Co.
Kalamazoo Railway Supply Co.
The Kerite Insulated Wire & Cable Co., Inc.
Lehon Company
Locomotive Finished Material Co.
Lundie Engineering Corp.
Maintenance Equipment Co.
Mall Tool Co.
Metal & Thermit Corporation
Morden Frog & Crossing Works
National Carbide Corporation
National Carbon Co.
National Lead Co.
National Lock Washer Co.
Nordberg Mfg. Co.
The Okonite Co.
The Oxweld Railroad Service Co.
The P & M Co.
Pettibone Mulliken Company
Pocket List of Railroad Officials
The Q & C Co.
The Rail Joint Co.
Railroad Accessories Corporation
The Rails Co.
Railway Maintenance Corporation
Railway Purchases & Stores
Railway Track-Work Co.
Ramapo Ajax Corp.
S. E. Rawls
Republic Steel Co.
Sellers Manufacturing Co.
Syntron Co.
Simmons-Boardman Publishing Corp.
Teleweld, Inc.
Templeton, Kenly & Co.
Thompson & Co.
United States Steel Corporation
U. S. Wind Engine & Pump Co.
Western Railroad Supply Co.
Yale & Towne Mfg. Co.

Associate members include:

American Chain Co.
Corning Glass Works
DeVilbiss Company
Frog, Switch & Mfg. Co.
General Railway Signal Co.
Gould Storage Battery Corp.
Inland Steel Co.
Jones & McLaughlin Steel Corp.
Massey Concrete Products Co.
National Aluminate Co.
Pittsburgh Plate Glass Co.
The Pyle National Company
Racor Pacific Frog & Switch Co.
Taylor-Wharton Iron & Steel Co.
Union Switch & Signal Co.
Warren Tool Company
Weir-Kilby Corp.
Youngstown Sheet & Tube Co.

Collisions between Motor Vehicles and Trains, Six Months Ended June 30

The Interstate Commerce Commission's Bureau of Statistics has issued tables compiled from monthly reports of railway accidents for the first six months of 1936 pertaining to collisions between motor vehicles and trains at highway grade crossings. Some comparisons are made with the same period of 1935.

Of the 1,927 accidents at highway grade crossings, 89 per cent involved either passenger automobiles, motor buses, or motor trucks. In the corresponding period of 1935, there were 1,828 crossing accidents and motor cars were involved in 88.73 per cent of the total number. Motor trucks were involved in 20.08 per cent of the total in the 1936 period, compared with 18.05 per cent in 1935.

The number of persons killed at public crossings in the 1936 period was 758 compared with 730 in 1935. There was also an increase in non-fatal injuries in 1936, the total of 2,268 reported in 1936 exceeding those reported for 1935 by 103. In the motor truck group, the deaths increased 15.52 per cent, and in all other groups together, 1.63 per cent.

There has been practically no change in the proportion of cases in which the motor vehicle was struck by the train. Out of a total of 1,719 accidents, there were 634 in which the motor vehicle ran into the side of the train.

Likewise there was but little change in the proportion of day and night accidents involving motor vehicles, a slight increase in the number occurring in daytime being indicated for 1936.

According to the tables, the most dangerous hour for motorists at rail-highway crossings in the 1936 period was between 11 and 11:59 p.m., and the greatest number of these accidents occurred on a Saturday.

Freight trains were involved in 761 or 44.27 per cent of accidents at crossings and passenger trains in 720 or 41.88 per cent. The factors of length of train and insufficient lighting seem to be reflected in the large number of night accidents involving freight trains and motor vehicles.

Collisions of trains and motor vehicles are classified for the first time in these statements as to location of crossing. The figures are tabulated as reported by the railways except where the location was described as "urban" notwithstanding it was indicated that the crossing was located in a town or village of less than 2,500 inhabitants. The value of this table is impaired by the large number of cases shown as "not reported."

High train speed does not seem to have been an important factor in grade crossing accidents. The largest proportion of these accidents, 23.91 per cent, occurred when the train was moving at a speed of 1 to 9 miles per hour. The fact that 6.92 per cent occurred when the train was not in motion is worthy of note. One hundred fourteen of these 119 accidents involving standing trains occurred at night, indicating that insufficient light on train or at crossing may have been responsible for a number of them, as before mentioned.

Letter Ballot Returns

The recommendations of various committees reporting at the Mechanical Division meeting held at Chicago, June 25 and 26, were ordered submitted to a letter ballot, the results of which have just been made available. These recommendations comprised a total of 99 propositions, divided between the various committees as follows: Brakes and Brake Equipment, 5; Car Construction, 6; Couplers and Draft Gears, 6; Air Conditioning and Equipment Lighting, 1; Loading Rules, 55; Locomotive Construction, 4; Lubrication of Cars and Locomotives, 1; Specifications for Materials, 14; Tank Cars, 4; Wheels, 3. All of these propositions to amend the standard and recommended practice of the Mechanical Division have been approved effective March 1, 1937, with the exception of proposition No. 5 covering Specifications for Repairs to Freight Equipment Brake Beams, which is approved effective January 1, 1937, and proposition No. 10 covering Definition and Designating Letters, which is approved effective immediately. Also, the propositions to amend the Loading Rules of the Division are approved, effective January 1, 1937. Detailed information regarding this letter ballot is made available in the Mechanical Division's circular No. D. V. —885 just issued by Secretary V. R. Hawthorne.

Equipment and Supplies

LOCOMOTIVES

THE WESTERN PACIFIC has issued inquiries for four 2-8-8-2 type, and seven 4-6-6-4 type locomotives.

FREIGHT CARS

THE WARRIOR RIVER TERMINAL COMPANY, Birmingham, Ala., is inquiring for 20 box cars of 40 tons' capacity.

PASSENGER CARS

THE GULF, MOBILE & NORTHERN has under consideration the question of buying one or two stream-lined trains of three cars each.

IRON & STEEL

THE TEXAS & PACIFIC has ordered 7,550 tons of rails from the Tennessee Coal, Iron & Railroad Company.

THE RICHMOND, FREDERICKSBURG & POTOMAC has ordered 1,575 tons of rails from the Bethlehem Steel Company.

PENNSYLVANIA. - - Anticipating further track improvements in 1937 in the light of the increased volume of traffic, and in preparation for continued advances in train speeds, this road announced on November 12 the purchase of 100,000 tons of new steel rail, involving an expenditure of approximately $4,000,000. The new tonnage will include approximately 36,000 tons of 152-lb. rail and 64,000 tons of 131-lb. rail. The last large order for rail was placed by the Pennsylvania late in 1933 when 100,000 were also purchased.

MACHINERY

THE WESTERN PACIFIC has issued an inquiry for one 200-ton wrecking crane.

AIR CONDITIONING

THE PENNSYLVANIA, on November 5, opened bids for refrigerating and drive apparatus to be used in equipping air conditioned cars.

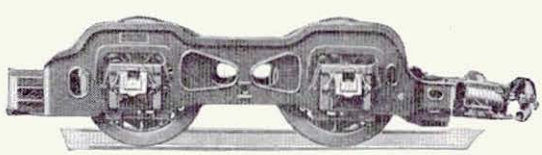
THE LOUISVILLE & NASHVILLE has authorized an appropriation of $800,000 to cover its air-conditioning program of passenger cars for next year. This includes the equipping of 80 all-steel coaches and three dining cars. This work will be carried out in the railroad's South Louisville, Ky., shops as soon as possible in order to have the equipment in service early next Spring. These cars, together with the 39 coaches and 13 diners, air-conditioned by the road and the Pullman cars thus equipped, will provide completely air-conditioned service on practically every Louisville & Nashville main line train, except some locals. It does not include local or suburban service.

Continued on next left-hand page

"They wake up smiling now!"

[THANKS TO THE BOOSTER]

"No Sir! There wasn't a single grouch on the whole train—and I wasn't called once all night." » » "Yes Sir, there's a reason! This train doesn't jar folks awake —it starts so easily they never know it—they sleep right along until morning." » » Pullman porters, perhaps better than anyone else, get passengers' reactions. » » And rested passengers, passengers that aren't awakened at every start, are the best advertisement the railroad can have. » » Booster trains start smoothly, they let passengers sleep all night and such passengers boost railroad travel.



FRANKLIN RAILWAY SUPPLY CO., INC.

NEW YORK
CHICAGO
MONTREAL

Supply Trade

R. H. Sonneborn, special representative of the pipe division of the **Republic Steel Corporation,** Cleveland, Ohio, has been promoted to assistant manager of sales of the pipe division.

Harvey N. Wood, general supply and central station manager at Philadelphia, Pa., of the **Graybar Electric Company,** has been appointed sales manager of the Graybar office at Philadelphia.

R. L. Lockwood, formerly director of the Section of Purchases—later the Section of Property and Equipment—under the Federal Co-ordinator of Transportation, has joined the **Motor Terminals Company,** New York, as vice-president.

The Corning Glass Works, Corning, N. Y., has acquired the Macbeth-Evans Glass Company of Pittsburgh, Pa. The two manufacturing plants of the Macbeth-Evans Glass Company, located at Charleroi, Pa., and Elwood, Ind., will be operated as divisions of the Corning Glass Works.

The Symington Company, Rochester, N. Y., has changed its corporate name to **The Symington-Gould Corporation** and acquired the entire capital stock of The Gould Coupler Corporation (formerly The Gould Coupler Company). No change is contemplated in the policies, management or business operations of either company.

Harold Byron Smith has been elected president of the **Shakeproof Lock Washer Company,** Chicago, to succeed his father, the late Harold C. Smith. The other officers of the company are now as follows: Frank W. England and Carl G. Olson, vice-presidents; Calmer L. Johnson, secretary and treasurer; Frank W. England, assistant secretary.

C. E. Murphy, 415 Midland building, Cleveland, Ohio, has been appointed representative in that region of the **Graham-White Sander Corporation,** Roanoke, Va., and **W. P. Thomas,** 4155 Garfield avenue, Minneapolis, Minn., has been appointed representative for the Minneapolis and St. Paul region. Mr. Thomas was formerly road foreman of engines on the Minneapolis & St. Louis and was service engineer of the Franklin Railway Supply Company.

An arrangement has been made between the **Safety Car Heating & Lighting Co.,** New York, and the **Spicer Manufacturing Company,** Toledo, Ohio, under which hereafter in addition to the direct gear drive now manufactured and sold by the Spicer Manufacturing Company, that company will also manufacture the Safety Car Heating & Lighting Co.'s Vee belt and gear drive for railway car generators. The Safety Car Heating & Lighting Co. will hereafter market both types of drives. This arrangement has been worked out in order to take advantage of the specialized manufacturing facilities of the Spicer Manufacturing Company, and to avoid the duplication of the Safety Car Heating & Lighting Co.'s existing nation-wide sales and servicing organization.

Norman B. Johnson has been appointed assistant chief engineer in charge of mechanical engineering for all plants of the **Pullman-Standard Car Manufacturing Company,** Chicago. Mr. Johnson entered the employ of Armour & Company in 1905, after which he was associated with the Chicago Railway Equipment Company from 1906 to 1909, and the American Car & Foundry Company at its Chicago plant from 1909 to 1916. In March, 1916, he became an engineer for the Haskell & Barker Car Company, and shortly thereafter was promoted to chief draftsman, which position he held until November, 1919, when he went to France in connection with export war equipment. On his return in 1921 he was promoted to assistant superintendent of the Michigan City plant of Haskell & Barker, which position he held until 1928 when he was promoted to production superintendent of the same plant but of the successor company,

Norman B. Johnson

the Pullman Car & Manufacturing Corporation, which later became the Pullman-Standard Car Manufacturing Company. He held the latter position until May, 1935, when he was transferred to the Pullman Car Works on special duty, which position he has held until his recent promotion.

N. W. Storer, consulting railway engineer of the **Westinghouse Electric & Manufacturing Company** at East Pittsburgh, Pa., whose retirement was announced in the *Railway Age* of November 7, took an active part in the electrification projects of the New York, New Haven & Hartford, the Pennsylvania, the St. Clair and Hoosac tunnels, the Chicago, Milwaukee & St. Paul (now the Chicago, Milwaukee, St. Paul & Pacific) and the Great Northern. Since Mr. Storer joined the Westinghouse organization immediately after his graduation from Ohio State University in 1891, he progressed steadily. As first assistant to the late Benjamin G. Lamme, he developed a line of small direct current multi-polar generators and motors that became the Westinghouse standard for more than 10 years. He worked out the root-mean-square method of rating or defining railway motor capacity which enabled engineers to predict service capacities and apply motors more accurately. During the time, 1904-1912, when Mr. Storer had charge of all railway development work, alternating and

N. W. Storer

direct current passenger locomotives, both gearless and geared, as well as freight switcher locomotives, were developed for the New York, New Haven & Hartford. Direct current locomotives for the New York terminal of the Pennsylvania and alternating current locomotives for the St. Clair and Hoosac tunnels were developed during this time, as were the first 1,500-volt direct current locomotives ever built. These were for the Piedmont & Northern. Since 1912 his work has been along general lines, including notable achievements in railway engineering. He served two terms as vice-president of the American Institute of Electrical Engineers and has been a member of its sub-committee on standards for more than 20 years.

OBITUARY

Edward A. Morse, vice-president of the Potosi Tie & Lumber Company, St. Louis, Mo., and first vice-president of the Railway Tie Association, was killed in

Edward A. Morse

an accident on October 31, when the automobile he was driving struck a culvert and turned over two miles north of Piedmont, Mo. He was born in St. Louis, Mo., in 1883, and attended Smith academy and

Continued on next left-hand page

A FEW ROWS OF BRICK

won't make a

BRICK ARCH

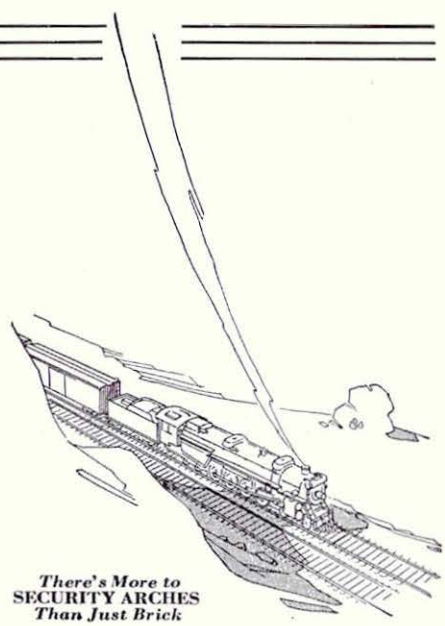
The same Brick Arch design won't do for all locomotives.

Fire box volume, grate area, fire box length and many other factors must be considered in designing an efficient firebox Brick Arch.

The American Arch Company engineers have spent lifetimes studying the ever changing conditions of locomotive operation and firebox design.

Security Brick Arch designs reflect this knowledge and experience. They give maximum economy in fuel and in arch maintenance.

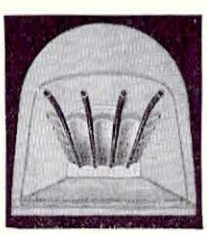
Be sure your locomotives are equipped with a properly designed Security Arch. Then be sure a complete arch is installed at every boiler wash period.



There's More to
SECURITY ARCHES
Than Just Brick

HARBISON-WALKER REFRACTORIES CO.

Refractory Specialists



AMERICAN ARCH CO.
INCORPORATED

Locomotive Combustion Specialists » » »

Culver Military academy. He began his business career as a clerk for the St. Louis-San Francisco and, in 1905, entered the employ of the Western Tie & Timber Company. In 1908 he was promoted to secretary of the company, which position he held until 1913, when he disposed of his interests to engage in business for himself. In that year he organized the Morse Land & Timber Company, Jonesboro, Ark., and operated on a tract of land on the line of the old Bonneville & Southwestern for 10 years. In 1923 he was appointed vice-president of the Potosi Tie & Lumber Company, which position he was holding at the time of his death. Mr. Morse had been interested in the Railway Tie Association since it was organized. He served as secretary in 1927 and 1928 and for a number of years as a member of its executive committee. At the convention in Cincinnati last May he was elected first vice-president.

Construction

CHESAPEAKE & OHIO.—A contract has been given to the Rail & Road Construction Company, Huntington, W. Va., for rebuilding arch culvert over Nats creek, Richardson, Ky., to cost about $77,700. Bids were received on November 11 to extend center passing siding B.S. Cabin, Va., to cost about $133,643.

NEW YORK CENTRAL.—The New York Public Service Commission has approved specifications and an estimate of cost, exclusive of land and property damages, of $228,000 in connection with the proposed elimination of the Sheridan Drive crossing of this road in the town of Tonawanda, N. Y. The commission also authorized the railroad to do certain work in connection with the elimination of the crossing by direct employment of labor and purchase of materials for $24,100. The crossing is three miles north of Black Rock station.

The commission also authorized the New York Central to do certain work in connection with the elimination of the Transit Road crossing in the village of Depew, N. Y., limiting the amount to be spent without contract to $66,500.

ST. LOUIS, MO.—The St. Louis Board of Public Service will receive new bids on November 27 on the construction of certain work on the railroad deck and tracks of the St. Louis Municipal Bridge across the Mississippi river between St. Louis, Mo., and East St. Louis, Ill., and the railroad approaches thereto. The work is estimated to cost $187,000. The lone bid received at the former letting, held on October 9, was $264,535 submitted by List & Weatherly Construction Company, Kansas City, Mo. On November 4 the board took new bids for furnishing and delivering of creosoted white oak ties for use on the bridge and its approaches. The lowest bid submitted was $4340 by the Republic Creosoting Company, Granite City, Ill.

Financial

AKRON, CANTON & YOUNGSTOWN.—*Reorganization Plan.*—A plan for the reorganization of this company and the Northern Ohio has been filed with the federal district court for the northern district of Ohio and with the Interstate Commerce Commission. It provides for fixed interest charges of $146,570 and contingent interest charges of $156,250 for the consolidated company as compared with fixed charges of the present companies amounting to $414,170.

ALABAMA & WESTERN FLORIDA.—*Acquisition and Securities.*—The Interstate Commerce Commission has authorized this company to purchase the railroad of the Sale-Davis Co. of Florida, Inc., extending from Greenhead, Fla., to Southport, 18.8 miles, and to issue 300 shares of $100-par common stock to be delivered to the vendor in part payment therefor.

ALTON.—*Joliet & Chicago Lease.*—This company has settled out of court litigation against it by the leased line whereby $3 a share will be paid to certain stockholders of the Joliet & Chicago who will waive their claims against the Alton and approve a supplemental lease. The Alton also conveys certain properties to the J. & C. and assumes certain legal expenses. The stockholders of the J. & C. are to meet November 30 to vote upon the agreement.

BIRMINGHAM SOUTHERN.—*Equipment Trust Certificates.*—This company has applied to the Interstate Commerce Commission for authority for an issue of $900,000 of 3½ per cent equipment trust certificates.

CHESAPEAKE & OHIO.—*Preferred Stock.*—Stockholders meeting in Richmond, Va., last week approved the proposed issue of preferred stock, the maximum being set at 40 per cent of the total stock and surplus.

ERIE.—*Abandonment.*—The Interstate Commerce Commission has authorized this company and the Moosic Mountain & Carbondale to abandon a part of the line of the latter company near Marshwood, Pa., 2.5 miles.

MAXTON, ALMA & SOUTHBOUND.—*Abandonment.*—This company has applied to the Interstate Commerce Commission for authority to abandon its line from Alma, N. C., to Rowland, 15.07 miles.

MISSOURI PACIFIC.—*Interest.*—Trustees of the Missouri Pacific have been authorized by the federal district court at St. Louis, Mo., to pay one-half of the six months' interest installment on first mortgage bonds of the New Orleans, Texas & Mexico, and half of the same period installment on five per cent income bonds of the same road.

NEW YORK, CHICAGO & ST. LOUIS.—*Equipment Trust Certificates.*—Stroud & Co. and several associated companies have made a public offering of $4,624,000 of 4 per cent 1934 equipment trust certificates of this company maturing 1937-49, priced to yield from ½ per cent to 3.6 per cent. The finance houses purchased these certificates from the Reconstruction Finance Corporation, paying a premium of 4 per cent for them to that government agency.

PIEDMONT & NORTHERN.—*Bonds.*—This company has applied to the Interstate Commerce Commission for authority to issue and sell $6,250,000 of 30-year 3¾ per cent first mortgage bonds and $475,000 of serial debentures to refund its 40-year first mortgage 5 per cent bonds which are to be called for redemption on January 1 at 105.

PITTSBURGH & WEST VIRGINIA.—*Equipment Trust Certificates.*—This company has applied to the Interstate Commerce Commission for authority for an issue of $350,000 of 2½ per cent equipment trust certificates.

TOLEDO, PEORIA & WESTERN.—*Bonds.*—This company has applied to the Interstate Commerce Commission for authority to issue $1,600,000 of first mortgage 4 per cent bonds, to refund $1,485,000 of outstanding 6 per cent bonds and $115,000 of expenditures for additions and betterments.

TENNESSEE CENTRAL.—*Acquisition.*—This company and the Nashville Terminal have applied to the Interstate Commerce Commission for authority for the purchase and consolidation of the property of the terminal company by the Tennessee Central, which controls it under a 99-year lease. The Tennessee Central proposes to purchase the outstanding first mortgage bonds and assume the net liabilities of the terminal company and to issue $5,500,000 of bonds under a new mortgage on the consolidated property.

Dividends Declared

Green Bay & Western.—$2.50; Class A, Debentures, $25.00, both payable November 27 to holders of record November 17.

Average Prices of Stocks and of Bonds

	Nov. 10	Last week	Last year
Average price of 20 representative railway stocks..	58.99	59.56	36.48
Average price of 20 representative railway bonds..	83.99	83.20	71.81

REVISION OF THE TYPOGRAPHY and format of railroad timetables would give great impetus to the re-discovery of rail travel by the American public, in the opinion of Gilbert Farrar, type counselor, who has been traveling throughout the country on the "Printers Progress Special." Mr. Farrar's views in this connection were revealed in a recent statement from American Type Founders, which, with several co-operating companies, is sponsoring the transcontinental tour of this exhibition train.

During the course of his tour Mr. Farrar has made a study of the reaction of the average traveler to the necessity of consulting timetables of the present design, and has reached the conclusion that "The complexity and lack of definition of the present-day timetable is a deterrent rather than an encouragement to travel."

Continued on next left-hand page

Exhaustive Road Tests

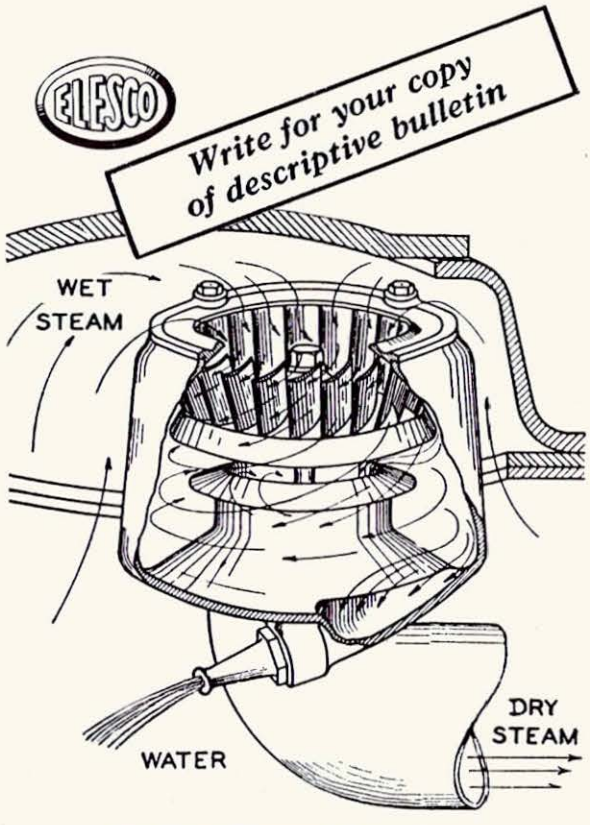
Confirm Laboratory Findings

An Elesco tangential steam dryer was installed on a large modern locomotive. Its ability to handle large quantities of water was demonstrated by spraying water into the dome just above the dryer, in quantities up to 20% of the water evaporated by the boiler.

When 8020 lb. of water were sprayed into the steam at the dryer, equivalent to 20.2% moisture, the tangential dryer separated and returned to the boiler 90% of the moisture, resulting in a drop of only 40 degrees in superheat. Had there been no dryer, not only would there have been no superheat, but water would have reached the cylinders.

The Elesco tangential steam dryer is 98% efficient under normal operating conditions, and will effectively handle as much as 20% of water in the steam at an efficiency of better than 90%.

A-1099



The Elesco Tangential Steam Dryer

THE SUPERHEATER COMPANY

Representative of American Throttle Company, Inc.

60 East 42nd Street, New York
Peoples Gas Building, Chicago
Canada:
The Superheater Company, Limited, Montreal

Superheaters • Superheater Pyrometers • Exhaust Steam Injectors • Feed Water Heaters • American Throttles • Tangential Steam Dryers

Railway Officers

EXECUTIVE

James N. Brand, whose appointment as assistant vice-president of the Atlantic Coast Line, with headquarters at Wilmington, N. C., was noted in the *Railway Age* of October 31, was born on December 16, 1871, in Clarendon county, S. C. He entered railroad service in 1889 as telegraph operator for the Atlantic Coast Line and served successively until 1894 as chief clerk to general manager, train dispatcher, and trainmaster. On October 1, 1894, he was appointed chief clerk to superintendent of transportation at Wilmington and became assistant superintendent transportation, First division, on November 1, 1902. On May 1, 1903, Mr. Brand became superintendent transportation, Second division, at Savannah, Ga.; on February 10, 1907, general superintendent, Second division; on February 1, 1914, general superintendent, Third division, and on November 16, 1915, assistant general manager at Wilmington, N. C. Mr. Brand became general manager on April 17, 1928, the position he held until his appointment as assistant vice-president, effective October 23.

George M. Crowson, assistant to the senior vice-president of the Illinois Central, who has been appointed assistant to the president, with headquarters as before at Chicago, as reported in the *Railway Age* of November 7, has been identified with the Illinois Central for 16 years, during 11 of which he has been in charge of public relations work. Mr. Crowson was born on February 9, 1896, at Pickering, Mo., and after completing his high school education he entered newspaper work at Maryville, Mo., in 1915. His newspaper work was interrupted for 12 months during the World War, when he served in overseas military service, returning after the war to the newspaper at Maryville. He was later employed in newspaper work at St. Joseph, Mo., where he remained until 1920. In that year he entered railway service with the Illinois Central at Chicago, as assistant to the general claim agent, his work having to do for the most part with publicity and the publication of the Illinois Central magazine. He was appointed editor of the magazine in May, 1921, holding this position until 1925, when he was appointed to the newly-created position of assistant to the vice-president in charge of public relations. In his new capacity as assistant to the president, he remains in charge of this work.

George M. Crowson

FINANCIAL, LEGAL AND ACCOUNTING

P. Heitmann, assistant auditor of the Grand Trunk Western, with headquarters at Detroit, Mich., has been promoted to auditor, with the same headquarters, to succeed **G. B. Bird,** who retires at his own request due to ill health.

OPERATING

G. W. Raney, transportation inspector of the Chicago, Rock Island & Pacific, with headquarters at Fort Worth, Tex., has been appointed superintendent of the southern division, with the same headquarters, to succeed **A. E. Walker,** retired.

James M. Baths has been appointed general manager of the Minneapolis, Northfield & Southern, the Minnesota Western and the Electric Short Line Terminal Company, with headquarters at Minneapolis, Minn.

William Dolphin, assistant superintendent of sleeping and dining cars of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Tacoma, Wash., has been promoted to superintendent of sleeping and dining cars, with headquarters at Chicago, and has been succeeded by **Thomas M. Durkin,** dining car inspector.

C. H. Lee, assistant superintendent of the New York, Chicago & St. Louis, with headquarters at Cleveland, Ohio, has been promoted to superintendent of the Fort Wayne and Chicago divisions, with headquarters at Fort Wayne, Ind., and has been succeeded by **F. A. Brown,** trainmaster at Conneaut, Ohio, who in turn has been succeeded by **R. D. Maloney,** trainmaster at Delphos, Ohio.

Frederick W. Brown, whose appointment as general manager for the Atlantic Coast Line, with headquarters at Wilmington, N. C., was reported in the *Railway Age* of October 31, was born on February 17, 1872, at New Canaan, Conn. He entered railroad service on June 1, 1887, as clerk in the freight office of the New York, New Haven & Hartford at Stamford, Conn., and served as operator and clerk for the Housatonic (now New Haven) from 1889 to 1891. Mr. Brown served with the New Haven as dispatcher from 1891 to 1895; dispatcher, chief dispatcher and trainmaster from 1895 to 1902; chief clerk to superintendent of the New York division from 1902 to 1905; and assistant superintendent at New Haven, Conn., from 1905 to 1906. In 1906 he went with the Southern serving until 1918 as dispatcher, trainmaster, superintendent of terminals, superintendent, chief of tonnage bureau, assistant to general manager, and assistant to vice-president. In 1918 he became staff officer of the Southern lines and associated railroads. Mr. Brown became assistant to general manager of the Atlantic Coast Line in March, 1920, and assistant general manager in April, 1929. He was appointed director of transportation of the Atlantic Coast Line in April, 1930, the position he held until his recent appointment as general manager.

Frederick L. King, whose appointment as superintendent passenger transportation for the Atlantic Coast Line at Wilmington, N. C., was reported in the *Railway Age* of October 31, was born on October 13, 1889, at Wilmington. He entered railroad service on April 1, 1905, with the Atlantic Coast Line and served until August of that year as waybill assorter in the office of the auditor of freight receipts. Mr. King was transferred to the car accounting office on August 1, 1905, as mail clerk and was appointed special agent, car service department, on June 1, 1912. On August 1, 1917, he was appointed chief clerk to superintendent car service; on December 13, 1917, chief clerk to general superintendent transportation; and on March 1, 1925, office assistant to general superintendent transportation. Mr. King was appointed special assistant, transportation department, on April 1, 1930, the position which he held until his recent appointment as superintendent passenger transportation.

Herbert M. Kendall, whose appointment as superintendent freight transportation of the Atlantic Coast Line, with headquarters at Wilmington, N. C., was noted in the *Railway Age* of October 31, was born on April 30, 1888, at Tarboro, N. C. He entered railroad service on June 1, 1904, with the Atlantic Coast Line as messenger in the Wilmington freight office and in October of that year was transferred to the office of the car accountant. Mr. Kendall was appointed special agent, car service department, on June 1, 1909, and became chief clerk to car accountant, June 1, 1912. He was transferred to the office of the superintendent of transportation at Savannah, Ga., on April 22, 1915, and on August 1, 1916, he was appointed special agent, transportation department, Savannah. After service in the World War, Mr. Kendall re-entered railroad service with the Atlantic Coast Line as assistant transportation inspector at Wilmington on March 1, 1919, and became office assistant to general superintendent transportation on March 15, 1925. He was appointed special assistant, transportation department, on the staff of the Director of transportation on April 1, 1930, the position which he retained until his recent appointment as superintendent freight transportation.

C. G. Adams, whose appointment as superintendent of the Nebraska-Colorado division of the Chicago, Rock Island & Pacific, with headquarters at Fairbury, Neb., was reported in the *Railway Age*

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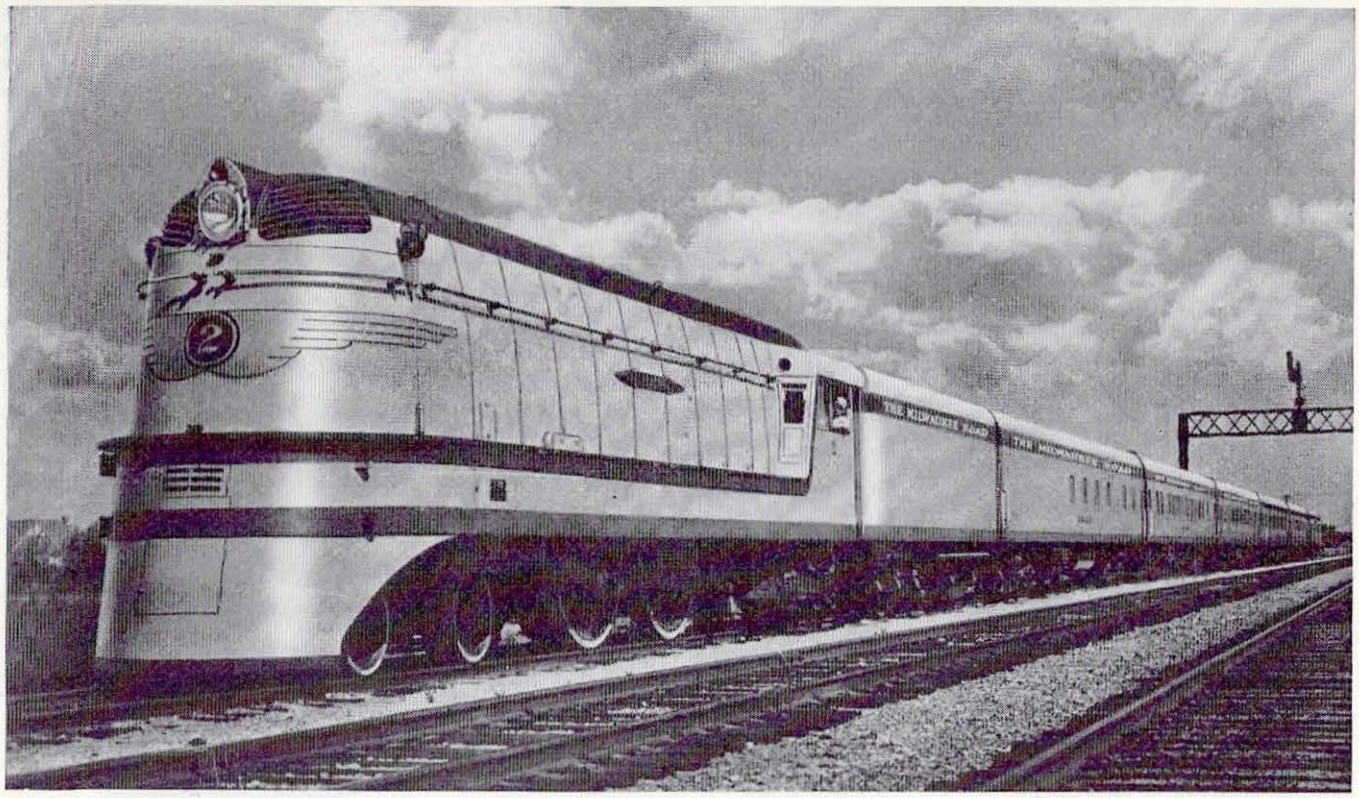

WAS THE INVESTMENT WORTH WHILE?

In the sixteen months they have been in operation the present "Hiawathas" have carried 350,000 paying passengers.

They earned approximately $750,000 net, after interest and depreciation, in the first year of their operation which ended May 31.

In June and July of this year net profit exceeded $160,000, or $40,000 more than in the corresponding two months of 1935.

Alco

AMERICAN LOCOMOTIVE COMPANY
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of October 31, has been identified with the Rock Island for 34 years. He was born on January 18, 1882, at Baltimore, Md., and entered railway service with the Rock Island in 1902. He served as a traveling accountant and statistician until 1905, when he was transferred to the general manager's office. After several years as chief clerk to the general superintendent he became chief clerk to the general manager, being appointed passenger trainmaster on the Chicago Terminal division on November 1, 1922. From May 1, 1927, to March 1, 1936, he served as trainmaster on the Nebraska-Colorado division, with headquarters at Goodland, Neb., being transferred to the Illinois division at the end of this period. On July 1 of this year he was appointed acting superintendent of the Nebraska-Colorado division, holding this position until his recent appointment as superintendent.

TRAFFIC

C. A. Hackenson, has been appointed district passenger agent of the Wabash, with headquarters at St. Louis, Mo.

A. K. Holmberg has been appointed assistant general freight agent of the Chicago, St. Paul, Minneapolis & Omaha, with headquarters at Minneapolis, Minn.

J. K. Williams has been appointed general agent of the Louisville & Nashville, with headquarters at Detroit, Mich., to succeed **L. G. Parsons,** deceased.

P. H. Coon, assistant general freight agent of the Missouri Pacific, with headquarters at St. Louis, Mo., has been appointed general freight agent, with headquarters at Houston, Tex., succeeding **A. W. Aylin.**

L. M. Jones, assistant general passenger agent of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, has been promoted to assistant passenger traffic manager, with the same headquarters. **William J. Cannon,** assistant general passenger agent, has been promoted to general passenger agent, and **Joseph Caldwell,** assistant general passenger agent, has been appointed first assistant general passenger agent.

James J. King, who has been promoted to general freight agent of the Akron, Canton & Youngstown, was born in Chicago on November 10, 1891, and, after graduating from De La Salle Institute in that city in 1909, entered the employ of the Erie as a stenographer in the local freight office. He held the latter position until 1911, when he was transferred to the general office of the traffic department, where he worked as a stenographer and later as a tariff compiler. In June, 1917, he resigned to become a tariff compiler for the Western Trunk Line Committee, which position he left in September of the same year to serve during the war in France. From September, 1919, to June, 1922, he engaged in industrial traffic work, being employed by the Goodyear Tire & Rubber Company and the International Harvester Company. On the latter date he entered the employ of the Akron, Canton & Youngstown as chief rate clerk at Akron, Ohio, which position he held until January, 1926, when he was promoted to chief clerk in the traffic department. In August, 1929, he was promoted to chief of the tariff bureau and in November, 1935, to assistant general freight agent, which position he held until his recent promotion.

C. H. Guion, assistant freight traffic manager of the Missouri Pacific, has been promoted to freight traffic manager, with headquarters as before at St. Louis, Mo., to succeed **D. R. Lincoln,** who has been appointed to the newly-created position of assistant to the chief traffic officer at St. Louis. In his new capacity, Mr. Guion will be in charge of rates. **H. M. Johnson,** assistant freight traffic manager, has been promoted to freight traffic manager in charge of solicitation to replace **O. G. Parsley,** who at his own request has been appointed special traffic representative. **J. R. Staley,** general freight agent, has been promoted to assistant freight traffic manager in charge of solicitation and **C. D. Bordelon,** assistant general freight agent, has been advanced to assistant freight traffic manager, rates. The headquarters of Mr. Johnson, Mr. Parsley, Mr. Staley and Mr. Bordelon will remain at St. Louis. **A. W. Aylin,** general freight agent at Houston, Tex., has been advanced to general freight agent, solicitation, with headquarters at St. Louis, and **H. R. Wilson,** assistant freight traffic manager, has been appointed general freight agent, rates, with headquarters as before at St. Louis.

Mr. Johnson was born on May 22, 1894, at East St. Louis, Ill., and prior to entering railway service in 1917, he served for several years with the Southern Freight Association at St. Louis, in various ca-

H. M. Johnson

pacities from tariff clerk to chief clerk. He entered railway service with the Missouri Pacific as a clerk in the freight traffic department and in 1920, he was advanced to chief clerk to the foreign freight agent, being further promoted to traveling foreign freight agent at St. Louis in May, 1923. Later he was made assistant foreign freight agent and in March, 1929, he was promoted to foreign freight agent. In June of the following year Mr. Johnson was further advanced to general freight agent at Kansas City, returning to St. Louis in November, 1932, as assistant freight traffic manager, which position he was holding at the time of his recent appointment as freight traffic manager.

ENGINEERING AND SIGNALING

Thomas J. Skillman, who has been appointed chief engineer-consultant of the Pennsylvania at Philadelphia, Pa., as reported in the *Railway Age* of November 7, was born in Trenton, N. J., on November 6, 1876. He was educated at the State

Thomas J. Skillman

Model School, Trenton, and at Princeton University, having been graduated in 1898, with a Civil Engineering degree. Mr. Skillman entered the service of the Pennsylvania as a blue-print boy in the office of the division engineer, New York division, at Jersey City on March 1, 1899, and in July of that year he was appointed rodman on the engineering corps. On May 1, 1900, he was transferred to the office of the principal assistant engineer of the United Railroads of New Jersey division and assigned to a corps in charge of the elevation of tracks through Newark, N. J. On April 25, 1902, he was transferred as transitman to the office of the principal assistant engineer at Altoona, Pa., and promoted to assistant supervisor, Tyrone division, at Tyrone, Pa., on February 1, 1903. He was transferred to the Philadelphia Terminal division on January 15, 1904, and to the Philadelphia division at Paoli, Pa., on March 1, 1905, as assistant supervisor. On August 1, 1905, he was promoted to supervisor, Pittsburgh division, at Uniontown, Pa., in charge of the lower end of Southwest branches. On March 15, 1909, he was transferred to Dravesburg, on the Monongahela division, as supervisor and on November 1, 1909, to New York as supervisor in charge of track construction work on the Pennsylvania Tunnel and Terminal railroad. Mr. Skillman was appointed division engineer of the New York, Philadelphia & Norfolk (P.R.R.) at Cape Charles, Va., on June 16, 1913, and on December 1, 1914, became division engineer of the West Jersey & Seashore railroad and Camden Terminal division at Camden, N. J.; and on April 16, 1917, was transferred to the

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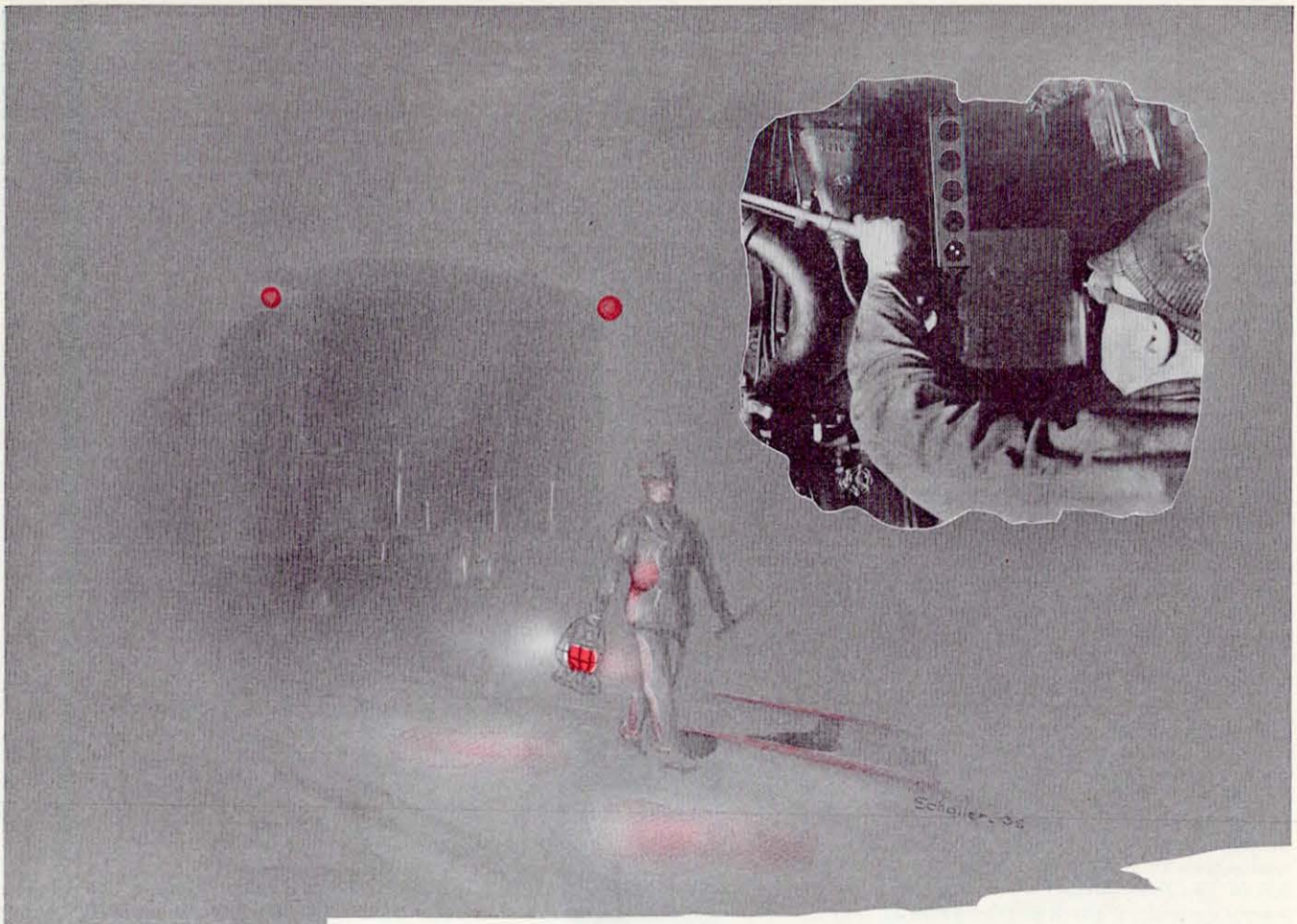

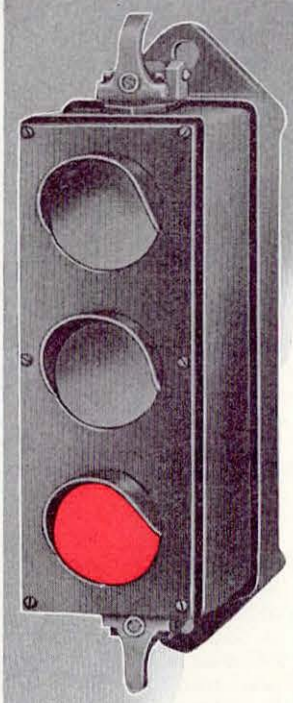

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Monongahela division at Pittsburgh. On July 1, 1917, he was assigned to the office of the general superintendent, New Jersey division, at New York, with special duties in connection with the study of terminal development at New York. On October 1, 1917, he was promoted to division engineer of the New York division at Jersey City and on November 10, 1919, to principal assistant engineer, Eastern Pennsylvania division, at Altoona, retaining this position under the U. S. Railroad Administration. On March 1, 1920, he was appointed chief engineer of maintenance of way, Northwestern region, with headquarters at Chicago. Upon the consolidation of the Northwestern and Southwestern regions on June 1, 1925, Mr. Skillman became chief engineer of maintenance of way, Western region, and on April 1, 1926, was promoted to the newly-created position of assistant chief engineer, P.R.R., with headquarters at Chicago. He was transferred to the Long Island on July 6, 1926, as chief engineer and returned to the Pennsylvania as chief engineer on February 1, 1927. On October 1, 1935, Mr. Skillman was granted a leave of absence on account of ill health.

William D. Wiggins, who has been appointed chief engineer of the Pennsylvania System, with headquarters at Philadelphia, Pa., as noted in the *Railway Age* of November 7, was born in Richmond, Ind., on April 28, 1873. He entered railroad service in 1889, as a clerk in the office of the road foreman of engines and general foreman of the Richmond shops of the Pittsburgh, Cincinnati & St. Louis (now part of the Pennsylvania), where he was employed for about three months. In 1892 he served for three months as assistant on engineer corps on the Richmond division and on September 1, 1895, after his graduation from the Rose Polytechnic Institute, he re-entered the service of the engineer corps at Logansport, Ind. He held various positions in the maintenance of way and construction departments, and, on June 10, 1901, was appointed engineer of maintenance of way of the Cincinnati & Muskingum Valley

William D. Wiggins

(now P.R.R.). He held the same position, and also that of division engineer on several other divisions of the Pennsylvania lines west of Pittsburgh, Pa. On November 1, 1912, Mr. Wiggins was appointed superintendent of the Peoria division, and, on July 1 of the following year he was promoted to valuation engineer of the Pennsylvania lines west of Pittsburgh, serving in that capacity during the administration of the Director General of Railroads. On March 1, 1920, upon the termination of federal control, he was appointed chief engineer of maintenance of way, Central region, with headquarters at Pittsburgh and in April 1, 1926, he was promoted to assistant chief engineer of the Pennsylvania with headquarters in that city. On February 1, 1927, he was appointed to the newly-created position of chief engineer of the Central region at Pittsburgh. On October 1, 1935, Mr. Wiggins was appointed acting chief engineer of the Pennsylvania to take over the duties of T. J. Skillman, who was granted a leave of absence on account of ill health.

William B. Wood, who has been appointed chief engineer of the Central region of the Pennsylvania at Pittsburgh, Pa., as reported in the *Railway Age* of November 7, was born on September 11, 1876, at Harrisburg, Pa. He was educated

William B. Wood

at Sheffield Scientific School, Yale University, from which he was graduated in 1897. Mr. Wood entered the service of the Pittsburgh, Cincinnati, Chicago & St. Louis (now Pennsylvania) on October 6, 1897, as rodman in the chief engineer's office at Pittsburgh. In 1898 he was transferred to the chief engineer's office of the Pennsylvania and in 1899, was appointed assistant engineer of the Cleveland and Pittsburgh division. In January, 1901, he was appointed engineer of maintenance of way on the Cincinnati & Muskingum Valley (now Pennsylvania). He was transferred to the Cleveland and Pittsburgh division in June, 1901. Mr. Wood was promoted to superintendent of the Richmond division in 1903, and in 1906 was transferred to the Cleveland, Akron & Columbus (Pennsylvania). He became superintendent of the Cleveland and Pittsburgh division in 1912 and in 1913 was appointed superintendent of the Eastern division. Mr. Wood was appointed general manager of the Grand Rapids & Indiana (now P.R.R.) on April 1, 1914, retaining that position under the United States Railroad Administration. On March 1, 1920, when the government relinquished the operation of railroads, Mr. Wood was appointed general superintendent of the Illinois division of the Pennsylvania, with headquarters at Chicago. For a short time in 1923 he was acting general manager of the Northwestern region, and on October 24, 1923, he was transferred to New York, as general superintendent of the New Jersey division. Because he was temporarily incapacitated as a result of an automobile accident Mr. Wood was on April 1, 1926, assigned to other duties until July 16, 1926, when he was appointed assistant to the general manager, Western region. On December 1, 1929, he became engineer in charge of the Baltimore improvements at Baltimore, Md., and on October 1, 1935, was appointed acting chief engineer of the Central region at Pittsburgh, which position he held until his recent appointment as chief engineer of that region.

MECHANICAL

B. M. Brown, chief assistant superintendent of motive power and equipment of the Texas & New Orleans, has been promoted to assistant general superintendent of motive power of the Pacific lines of the Southern Pacific, with headquarters at San Francisco, Cal.

OBITUARY

Arthur Bointon Shafer, who retired on October 1, 1920, as superintendent of the Delaware and Jefferson division of the Erie at Susquehanna, Pa., died on November 9 at Millville, N. J., Hospital. He was 65 years old.

Charles Patterson McCausland, engineer in charge of surveys and railway construction for the Western Maryland, with headquarters at Baltimore, Md., died on November 5 at his home in that city. He was 55 years old.

George P. Flood, special assistant to the general manager of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, died at Grays Lake, Ill., on November 8. Mr. Flood entered the employ of the engineering department of the Milwaukee in November, 1908, and since 1913 has been a member of the general manager's staff.

Joe T. Averitt, coal traffic manager of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, died at his home at LaGrange (Chicago) on November 1 following a lingering illness. Mr. Averitt, who was 61, was born at Harristown, Ill., and entered railway service in 1898 at Goodwine, Ill. In 1911 he was appointed assistant general freight agent of the Chicago, Terre Haute & Southeastern (now part of the Milwaukee), with headquarters at Terre Haute, Ind. Nine years later he was advanced to general freight and passenger agent of this company, which position he held until July, 1921, when he was appointed coal traffic manager of the Milwaukee.

Table of Freight Operating Statistics begins on next left-hand page

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Freight Operating Statistics of Large Steam Railways—Selected Items for the Month of August,

Region, road, and year	Miles of road operated	Train-miles	Locomotive-miles: Principal and helper	Locomotive-miles: Light	Car-miles: Loaded (*thousands*)	Car-miles: Per cent loaded	Ton-miles (*thousands*): Gross, excluding locomotives and tenders	Ton-miles (*thousands*): Net, revenue and non-revenue	Number of road locomotives on line: Serviceable: Not stored	Number of road locomotives on line: Serviceable: Stored	Number of road locomotives on line: Unserviceable	Number of road locomotives on line: Per cent unserviceable
New England Region:												
Boston & Albany....1936	373	126,490	130,235	8,499	3,064	69.6	159,873	56,778	60	6	26	28.3
1935	373	117,499	121,045	7,588	2,943	70.1	149,483	51,307	46	18	32	33.3
Boston & Maine....1936	1,963	263,765	291,731	25,456	9,286	72.9	487,733	187,023	113	8	163	57.4
1935	1,971	247,289	271,625	22,901	8,379	73.3	422,485	156,843	113	10	165	57.3
N. Y., New Hav. & Hartf..1936	2,016	323,553	393,549	19,309	11,007	69.6	576,228	220,342	171	19	99	36.4
1935	2,050	308,897	377,235	18,745	10,060	67.8	522,439	189,032	176	11	112	37.5
Great Lakes Region:												
Delaware & Hudson....1936	831	211,553	282,388	30,876	7,336	68.4	439,400	210,210	95	135	38	14.2
1935	835	183,605	240,484	26,757	6,101	67.2	354,733	161,527	94	155	31	11.1
Del., Lack. & Western....1936	983	345,626	380,867	51,139	11,637	70.2	653,135	257,882	133	1	106	44.2
1935	992	310,818	343,415	43,246	9,993	68.0	555,390	208,819	111	43	88	36.4
Erie (incl. Chi. & Erie)...1936	2,298	688,988	723,463	36,647	30,322	66.7	1,815,303	674,741	211	46	219	46.0
1935	2,307	654,463	679,642	34,422	26,454	65.3	1,596,577	585,557	207	71	196	41.4
Grand Trunk Western....1936	1,027	235,806	236,725	2,150	5,813	63.9	349,010	125,559	84	1	53	38.4
1935	1,007	202,068	203,666	1,253	5,140	62.7	308,933	108,558	71	..	71	50.0
Lehigh Valley 1936	1,312	346,887	368,891	44,188	12,597	67.7	764,118	323,149	124	10	155	53.6
1935	1,332	323,952	339,540	32,761	10,126	67.1	609,831	242,535	131	18	160	51.8
New York Central....1936	10,789	2,637,685	2,780,840	165,765	88,836	61.5	5,733,473	2,400,169	835	137	539	35.7
1935	10,919	2,304,765	2,410,699	133,386	75,720	62.2	4,741,293	1,964,659	692	169	656	43.2
N. Y., Chicago & St. Louis.1936	1,672	487,888	491,561	7,230	17,396	66.6	1,028,379	401,632	149	14	29	15.1
1935	1,661	415,179	418,774	5,390	14,075	64.8	825,829	307,287	123	47	21	11.0
Pere Marquette 1936	2,081	337,592	348,544	3,883	8,143	62.8	541,205	221,596	107	6	36	24.2
1935	2,096	318,258	331,603	3,612	7,672	62.9	484,999	188,772	103	6	47	30.1
Pittsburgh & Lake Erie....1936	234	85,057	87,395	150	3,437	62.7	292,497	168,491	22	21	27	38.6
1935	234	70,814	72,456	—	3,006	61.0	259,547	149,475	27	6	38	53.5
Wabash 1936	2,435	574,564	582,686	12,202	17,377	67.0	991,304	352,797	135	32	143	46.1
1935	2,435	509,706	517,080	11,015	15,766	65.5	900,135	306,143	120	38	169	51.7
Central Eastern Region:												
Baltimore & Ohio....1936	6,366	1,495,689	1,828,046	184,353	46,159	64.6	3,096,702	1,425,886	643	35	628	48.1
1935	6,319	1,274,283	1,546,854	157,820	37,924	64.0	2,503,710	1,115,616	578	135	602	45.8
Central of New Jersey....1936	681	146,297	166,213	31,608	4,768	62.6	314,713	145,937	54	17	76	51.7
1935	684	132,382	147,247	23,868	4,131	61.9	270,461	123,363	53	18	85	54.5
Chicago & Eastern Illinois..1936	931	165,907	166,667	2,702	4,242	69.7	251,808	108,692	51	2	54	50.5
1935	939	162,417	162,933	2,536	3,547	69.0	209,346	91,648	45	8	56	51.4
Elgin, Joliet & Eastern....1936	434	96,496	97,476	1,191	2,457	61.4	188,557	93,602	57	..	30	34.5
1935	434	81,815	82,935	680	1,966	62.0	148,130	73,775	52	4	31	35.6
Long Island 1936	393	32,527	33,237	15,794	281	50.7	21,607	7,848	32	3	15	30.0
1935	393	26,801	27,410	13,751	190	50.1	14,706	5,386	30	2	19	37.3
Pennsylvania System 1936	9,801	3,069,863	3,467,532	393,870	108,663	64.2	7,267,219	3,313,297	1,423	130	821	34.6
1935	10,009	2,464,403	2,756,835	281,510	88,029	65.5	5,663,955	2,537,982	1,128	261	1,050	43.1
Reading 1936	1,449	410,521	445,258	50,176	11,751	63.3	834,480	401,158	193	57	100	28.6
1935	1,452	333,205	359,058	37,335	9,304	62.1	635,143	289,176	166	101	102	27.6
Pocahontas Region:												
Chesapeake & Ohio....1936	3,050	875,606	926,098	41,010	41,589	57.1	3,486,049	1,915,469	386	54	99	18.4
1935	3,050	778,262	813,768	32,277	34,197	57.1	2,872,657	1,570,557	361	90	99	18.0
Norfolk & Western....1936	2,145	672,152	716,035	34,075	29,075	60.3	2,365,214	1,294,384	256	64	47	12.8
1935	2,145	572,201	594,759	25,426	23,303	60.9	1,888,247	1,000,127	219	103	59	15.5
Southern Region:												
Atlantic Coast Line....1936	5,082	502,173	504,003	7,044	10,219	67.9	535,706	200,141	198	74	120	30.6
1935	5,147	437,317	437,641	6,034	8,918	69.0	444,549	161,398	241	61	129	29.9
Central of Georgia....1936	1,886	243,863	245,319	3,535	5,304	74.7	277,961	108,803	98	..	27	21.6
1935	1,886	211,866	212,308	3,335	4,777	72.4	245,971	94,948	96	..	46	32.4
Illinois Central (incl. Y. 1936	6,562	1,552,307	1,561,562	29,550	37,843	62.9	2,423,024	992,782	669	13	216	24.1
& M. V.)....1935	6,587	1,355,861	1,363,370	25,222	32,312	63.3	2,033,154	829,932	580	47	229	26.8
Louisville & Nashville....1936	4,979	1,072,347	1,174,513	29,337	26,103	61.2	1,822,688	887,151	351	19	209	36.1
1935	5,045	889,812	961,847	22,639	20,802	62.5	1,426,223	699,000	272	29	281	48.3
Seaboard Air Line 1936	4,295	405,624	417,804	3,503	10,528	70.4	570,616	223,140	199	21	114	34.1
1935	4,295	386,618	390,517	2,949	8,840	69.5	480,975	180,993	196	26	123	35.7
Southern 1936	6,596	1,242,471	1,263,391	20,856	29,878	70.7	1,579,136	619,117	478	39	271	34.4
1935	6,599	1,076,481	1,090,990	17,896	24,966	70.1	1,316,233	508,393	413	60	335	41.5
Northwestern Region:												
Chicago & North Western..1936	8,355	1,084,322	1,137,666	33,667	29,428	63.3	1,841,968	676,844	382	124	206	28.9
1935	8,428	944,286	988,760	25,970	24,941	64.1	1,532,445	547,622	439	115	207	27.2
Chicago Great Western....1936	1,458	280,358	281,076	11,949	8,296	62.2	510,009	181,030	67	..	19	22.1
1935	1,458	224,282	224,992	6,855	6,776	62.0	411,716	147,965	56	6	32	34.0
Chi., Milw., St. P. & Pac..1936	11,120	1,492,873	1,603,483	68,077	41,388	61.4	2,625,113	1,038,508	468	74	136	20.1
1935	11,119	1,300,028	1,373,014	60,434	35,309	62.5	2,199,390	891,725	400	109	153	23.1
Chi., St. P., Minneap. & Om.1936	1,637	257,227	277,106	11,475	5,758	65.1	365,564	151,418	94	34	19	12.9
1935	1,641	220,397	226,103	9,274	4,867	67.5	291,348	121,868	67	42	34	23.8
Great Northern 1936	8,059	892,102	891,859	27,919	31,254	57.1	2,239,624	1,003,913	385	37	166	28.2
1935	8,031	827,674	834,152	23,134	27,951	57.8	1,964,036	865,646	360	57	183	30.5
Minneap. St. P. & S. St. M..1936	4,273	391,278	399,905	5,274	9,351	67.0	560,866	237,475	121	..	28	18.8
1935	4,273	368,733	374,132	3,221	8,058	64.1	474,058	196,978	142	..	22	13.4
Northern Pacific 1936	6,429	854,764	960,765	67,638	25,773	58.8	1,674,652	613,021	365	8	73	16.4
1935	6,421	662,167	734,965	51,166	20,332	62.8	1,273,870	505,342	336	7	109	24.1
Central Western Region:												
Alton 1936	928	209,710	218,961	1,839	4,846	62.8	308,772	117,659	78	1	22	21.8
1935	921	202,993	214,178	1,879	4,418	60.2	285,517	102,769	70	..	35	33.3
Atch., Top. & S. Fe. (incl. 1936	13,228	1,842,059	1,995,134	94,367	52,394	62.2	3,327,470	1,115,046	553	84	332	34.3
P. & S.F. & G.C. & S.F.).1936	13,260	1,630,818	1,731,873	71,623	44,299	62.3	2,732,208	887,977	494	132	369	37.1
Chicago, Burl. & Quincy...1936	8,935	1,370,215	1,433,967	54,598	36,697	59.9	2,275,925	925,973	442	2	96	17.8
1935	8,971	1,202,284	1,253,023	43,274	30,511	60.6	1,844,893	765,207	454	9	92	16.6
Chi., Rock I. & Pac. (incl. 1936	8,179	1,179,172	1,197,114	5,523	26,409	64.4	1,607,781	629,948	381	38	281	40.1
Chi., Rock I. & Gulf)....1935	8,272	1,011,094	1,019,678	4,551	22,281	64.2	1,336,795	513,986	386	29	317	43.3
Denv. & Rio Gr. Western..1936	2,584	363,595	402,109	47,162	9,170	64.5	595,390	234,333	184	3	18	8.8
1935	2,584	276,375	300,760	30,471	6,859	64.9	421,782	157,829	168	7	44	20.1
Southern Pac.—Pac. Lines.1936	8,614	1,505,062	1,641,611	192,596	47,407	63.4	2,994,583	1,064,376	506	85	184	23.7
1935	8,599	1,223,588	1,321,833	147,061	38,996	60.3	2,504,438	815,644	424	109	254	32.3
Union Pacific 1936	9,918	2,013,042	2,086,530	113,868	63,208	62.6	3,983,981	1,366,221	668	44	166	18.9
1935	9,824	1,833,568	1,912,910	118,332	55,273	58.2	3,499,301	1,166,724	601	56	231	26.0
Southwestern Region:												
Mo.-Kans.-Texas Lines 1936	3,282	378,793	383,795	6,450	10,317	63.7	618,931	223,897	93	33	81	39.1
1935	3,282	364,504	367,863	5,299	10,173	62.5	612,929	221,628	86	29	82	41.6
Missouri Pacific 1936	7,188	1,265,251	1,300,418	30,674	35,303	62.0	2,213,429	854,780	330	74	127	23.9
1935	7,202	1,110,774	1,138,817	23,610	29,038	61.3	1,828,344	678,060	265	114	157	29.3
St. Louis-San Francisco....1936	4,888	748,326	754,910	10,685	16,418	62.2	1,013,665	395,792	283	77	65	15.3
1935	4,896	662,496	668,364	8,567	14,455	62.1	887,234	352,497	258	110	64	14.8
St. Louis Southw. Lines...1936	1,733	229,267	229,930	2,915	6,595	68.1	350,198	135,515	92	21	6	5.0
1935	1,774	208,221	219,879	2,810	5,159	66.5	288,931	104,286	94	17	9	7.5
Texas & New Orleans....1936	4,416	537,465	537,558	6,892	12,964	67.3	782,143	307,230	195	48	55	18.5
1935	4,417	480,184	480,195	3,838	10,378	63.9	633,885	226,648	181	58	61	20.3
Texas & Pacific....1936	1,945	269,428	269,428	1,503	8,320	64.5	501,009	183,980	56	63	96	44.7
1935	1,945	247,991	247,991	1,646	7,333	66.1	430,151	151,511	76	68	77	34.8

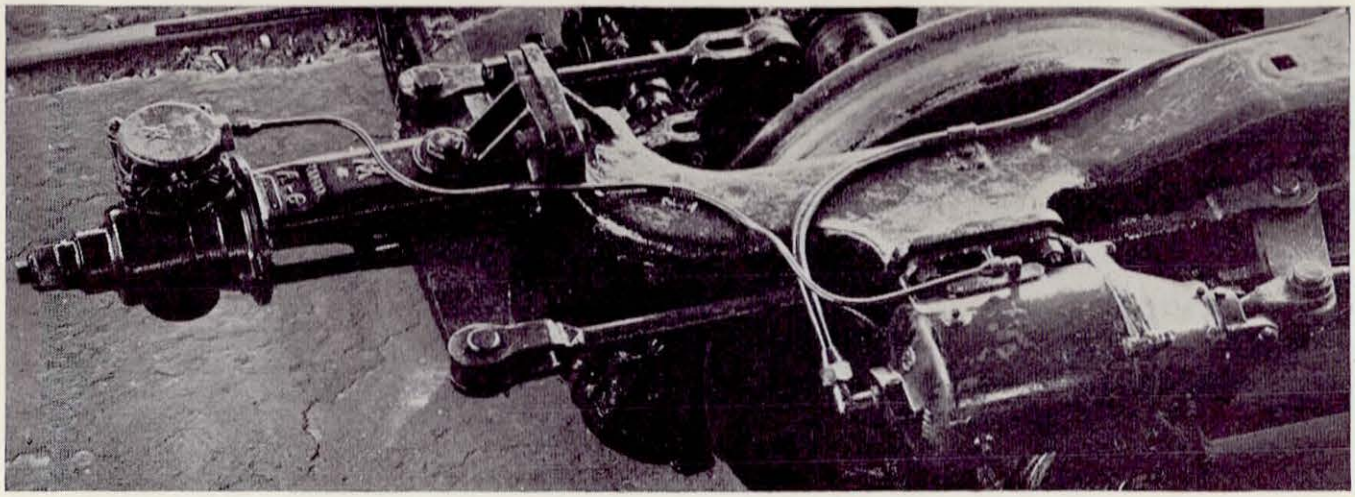
NOTE:—Effective with carrier reports for the month of January, 1936, the rules relative to operating statistics of large steam railways were revised with the following effect on this statement: Miles of road operated, number of locomotives on line, and number of freight cars on line were changed from averages for the month to actual figures as of the close of the month. Freight train and locomotive miles, which formerly applied only to freight trains and the *freight proportion of mixed trains*, based on car-miles, were changed to apply to freight trains and all mixed trains handling more freight-train cars than passenger-train cars. Carriers were not required to rework 1935 figures according to the revised rules, but they have in some cases supplied considerable comparable data. In other cases, the figures shown in this statement for last year were restated by the carriers from last year's reports, or inserted from such reports by the Bureau of Statistics.

1936, Compared with August, 1935, for Roads with Annual Operating Revenues above $25,000,000

Region, road, and year	Number of freight cars on line: Home	Foreign	Total	Per cent unserviceable	Gross ton-miles per train-hour, excluding locomotives and tenders	Gross ton-miles per train-mile, excluding locomotives and tenders	Net ton-miles per train-mile	Net ton-miles per loaded car-mile	Net ton-miles per car-day	Car-miles per car-day	Net ton-miles per mile of road per day	Pounds of coal per 1,000 gross ton-miles, including locomotives and tenders	Locomotive-miles per locomotive-day
New England Region:													
Boston & Albany.....1936	2,357	3,867	6,224	26.0	21,201	1,268	450	18.5	299	23.2	4,912	148	48.6
1935	2,660	3,872	6,532	26.9	21,188	1,278	439	17.4	248	20.3	4,435	147	43.2
Boston & Maine.....1936	7,879	7,462	15,341	16.7	25,465	1,857	712	20.1	401	27.3	3,073	98	35.3
1935	8,328	6,721	15,049	15.9	23,326	1,716	637	18.7	337	24.6	2,567	100	33.0
N. Y., New Hav. & Hartf..1936	11,874	10,112	21,986	18.0	25,530	1,812	693	20.0	323	23.2	3,526	98	46.2
1935	14,904	10,064	24,968	17.3	24,147	1,725	624	18.8	244	19.2	2,975	101	42.7
Great Lakes Region:													
Delaware & Hudson.....1936	8,389	3,389	11,778	5.0	29,625	2,092	1,001	28.7	565	28.8	8,163	102	37.3
1935	11,622	2,404	14,026	4.3	27,153	1,945	886	26.5	378	21.2	6,238	107	31.1
Del., Lack. & Western.....1936	13,573	5,815	19,388	17.2	31,569	1,917	757	22.2	424	27.3	8,465	125	57.6
1935	16,521	4,934	21,455	12.4	29,470	1,815	682	20.9	302	21.3	6,791	130	52.2
Erie (incl. Chi. & Erie)...1936	17,063	20,003	37,066	3.2	43,424	2,655	987	22.3	590	39.8	9,474	92	51.5
1935	21,516	11,990	33,506	5.8	41,165	2,450	898	22.1	561	38.8	8,189	89	48.6
Grand Trunk Western.....1936	5,628	6,551	12,179	18.3	29,012	1,497	539	21.6	351	25.4	3,943	93	55.4
1935	4,994	5,929	10,923	20.2	29,208	1,537	540	21.4	317	23.9	3,479	99	46.7
Lehigh Valley 1936	12,080	9,141	21,221	6.4	38,398	2,240	947	25.7	494	28.4	7,943	113	46.3
1935	13,391	5,770	19,161	6.6	34,185	1,919	763	24.0	392	24.4	5,872	120	38.4
New York Central.....1936	101,637	66,258	167,895	21.2	36,420	2,200	921	27.0	463	27.8	7,176	96	62.8
1935	123,164	61,003	184,167	19.8	34,418	2,083	863	25.9	344	21.3	5,804	96	54.1
N. Y., Chicago & St. Louis.1936	6,000	7,944	13,944	3.5	38,257	2,113	825	23.1	899	58.4	7,750	82	83.6
1935	7,650	8,046	15,696	5.8	35,345	1,993	742	21.8	651	45.9	5,969	83	71.6
Pere Marquette 1936	8,558	6,216	14,774	5.9	26,230	1,605	657	27.2	499	29.2	3,434	87	76.0
1935	10,051	5,721	15,772	4.3	24,914	1,527	594	24.6	397	25.7	2,906	86	68.7
Pittsburgh & Lake Erie....1936	12,882	11,675	24,557	42.9	48,483	3,445	1,985	49.0	213	6.9	23,244	84	40.9
1935	15,404	12,460	27,864	46.3	51,899	3,682	2,120	49.7	177	5.8	20,634	86	32.9
Wabash 1936	11,940	9,900	21,840	4.7	35,195	1,742	620	20.3	528	38.7	4,674	99	62.1
1935	13,217	8,336	21,553	2.5	34,326	1,783	607	19.4	450	35.4	4,056	102	52.3
Central Eastern Region:													
Baltimore & Ohio.....1936	66,352	27,562	93,914	20.1	27,121	2,101	967	30.9	490	24.5	7,225	131	49.7
1935	74,129	20,414	94,543	19.7	25,889	1,992	888	29.4	381	20.2	5,695	137	41.8
Central of New Jersey.....1936	11,181	10,612	21,793	33.4	26,226	2,253	1,045	30.6	219	11.4	6,911	141	43.4
1935	12,501	7,959	20,460	31.4	25,580	2,119	966	29.9	192	10.4	5,818	138	35.4
Chicago & Eastern Illinois..1936	3,195	3,202	6,397	9.7	26,862	1,520	656	25.6	531	29.7	3,765	116	51.1
1935	3,733	2,980	6,713	14.7	24,525	1,296	567	25.8	456	25.6	3,149	127	49.0
Elgin, Joliet & Eastern.....1936	7,962	5,083	13,045	4.9	17,690	1,997	991	38.1	238	10.2	6,956	101	36.6
1935	7,657	2,958	10,615	6.6	17,283	1,851	922	37.5	228	9.8	5,482	110	31.2
Long Island 1936	606	3,176	3,782	2.4	5,490	677	246	27.9	71	5.0	645	327	31.6
1935	775	2,498	3,273	3.8	4,729	562	206	28.3	52	3.7	442	351	25.5
Pennsylvania System 1936	192,178	66,627	258,805	18.2	34,027	2,409	1,098	30.5	413	21.1	10,905	112	52.4
1935	237,678	53,000	290,678	16.0	32,077	2,336	1,047	28.8	283	15.0	8,180	113	40.0
Reading 1936	23,180	11,549	34,729	11.3	25,158	2,038	980	34.1	362	16.7	8,931	128	45.1
1935	31,135	7,509	38,644	9.0	24,959	1,913	871	31.1	243	12.6	6,426	138	34.7
Pocahontas Region:													
Chesapeake & Ohio.....1936	36,967	15,079	52,046	1.5	56,320	4,025	2,211	46.1	1,176	44.7	20,260	68	58.3
1935	37,970	11,898	49,868	2.5	52,235	3,727	2,037	45.9	996	38.0	16,611	69	49.3
Norfolk & Western.....1936	28,356	6,100	34,456	2.3	51,306	3,539	1,937	44.5	1,184	44.1	19,468	95	66.3
1935	33,091	4,573	37,664	3.4	48,020	3,324	1,761	42.9	839	32.1	15,042	96	52.4
Southern Region:													
Atlantic Coast Line.....1936	17,711	7,595	25,306	27.0	18,602	1,069	399	19.6	260	19.5	1,270	109	41.8
1935	22,596	5,683	28,279	20.0	17,472	1,017	369	18.1	187	14.9	1,012	116	32.6
Central of Georgia.....1936	2,567	3,859	6,426	3.6	20,782	1,144	448	20.5	546	35.6	1,861	115	64.2
1935	5,392	3,243	8,635	20.5	21,034	1,162	449	19.9	355	24.7	1,624	120	49.0
Illinois Central (incl. Y. 1936	34,594	22,180	56,774	26.0	25,901	1,571	644	26.2	569	34.4	4,880	120	57.6
& M. V.).....1935	41,765	18,734	60,499	35.3	24,431	1,508	616	25.7	444	27.3	4,065	120	51.8
Louisville & Nashville.....1936	32,862	9,925	42,787	25.7	26,193	1,703	829	34.0	637	30.7	5,747	117	67.3
1935	37,557	7,383	44,940	30.8	24,861	1,607	788	33.6	480	23.0	4,470	123	54.6
Seaboard Air Line.....1936	8,556	5,778	14,334	2.7	23,119	1,420	555	21.2	516	33.8	1,676	111	40.6
1935	9,805	3,757	13,562	4.0	20,917	1,256	473	20.5	435	30.6	1,359	115	36.8
Southern 1936	22,670	18,495	41,165	16.7	21,280	1,278	501	20.7	491	33.5	3,028	146	52.4
1935	25,431	15,030	40,461	14.6	20,735	1,229	475	20.4	407	28.5	2,485	148	44.3
Northwestern Region:													
Chicago & North Western..1936	36,107	24,110	60,217	8.9	26,099	1,705	626	23.0	357	24.5	2,613	109	53.4
1935	39,339	24,274	63,613	10.9	24,081	1,629	582	22.0	270	19.2	2,096	111	43.0
Chicago Great Western.....1936	1,898	4,441	6,339	2.5	31,709	1,821	647	21.8	885	65.2	4,005	117	108.6
1935	1,949	4,133	6,082	2.1	33,917	1,838	660	21.8	852	62.9	3,273	119	79.1
Chi., Milw., St. P. & Pac..1936	44,101	24,790	68,891	2.6	27,963	1,768	700	25.1	494	32.1	3,013	113	79.4
1935	48,884	17,452	66,336	2.6	26,363	1,701	690	25.3	434	27.5	2,587	116	69.8
Chi., St. P., Minneap. & Om.1936	3,534	6,740	10,274	9.2	18,732	1,440	597	26.3	485	28.3	2,984	104	63.8
1935	2,420	7,888	10,308	9.3	18,682	1,348	564	25.0	401	23.7	2,395	105	53.1
Great Northern 1936	36,688	17,383	54,071	6.0	37,978	2,532	1,135	32.1	625	34.0	4,018	95	50.6
1935	39,517	15,898	55,415	5.7	35,756	2,386	1,052	31.0	524	29.3	3,477	103	46.2
Minneap. St. P. & S. St. M..1936	12,576	5,523	18,099	6.0	22,311	1,440	610	25.4	431	25.3	1,793	91	85.4
1935	13,596	5,538	19,134	3.4	20,363	1,294	538	24.4	337	21.5	1,487	96	75.1
Northern Pacific 1936	26,122	10,561	36,683	9.2	30,551	1,968	720	23.8	561	40.1	3,076	136	74.4
1935	31,297	7,384	38,681	12.0	29,437	1,929	765	24.9	421	26.9	2,539	137	56.0
Central Western Region:													
Alton 1936	2,313	6,729	9,042	23.0	34,081	1,478	563	24.3	419	27.5	4,089	108	70.5
1935	2,392	7,003	9,395	20.4	32,156	1,412	508	23.3	358	25.6	3,599	109	67.0
Atch., Top. & S. Fe. (incl. 1936	64,460	13,048	77,508	11.0	33,943	1,811	607	21.3	459	34.7	2,719	110	69.5
P. & S.F. & G.C. & S.F.).1936	71,851	11,162	83,013	11.6	31,188	1,681	546	20.0	343	27.5	2,160	114	58.5
Chicago, Burl. & Quincy...1936	25,017	18,228	43,245	8.3	28,548	1,672	680	25.2	674	44.6	3,343	112	88.8
1935	30,744	14,777	45,521	9.1	26,108	1,541	639	25.1	540	35.5	2,751	112	75.3
Chi., Rock I. & Pac. (incl. 1936	22,777	14,271	37,048	9.2	24,092	1,367	536	23.9	553	36.0	2,485	123	55.2
Chi., Rock I. & Gulf)....1935	28,425	12,278	40,703	13.1	22,797	1,325	510	23.1	408	27.6	2,004	126	45.4
Denv. & Rio Gr. Western..1936	12,193	5,297	17,490	7.4	24,969	1,645	648	25.6	431	26.2	2,925	151	70.7
1935	12,636	4,858	17,494	5.0	23,034	1,533	573	23.0	296	19.8	1,970	159	49.2
Southern Pac.—Pac. Lines.1936	32,164	29,052	61,216	7.8	30,822	2,006	713	22.5	556	39.0	3,986	101	75.6
1935	34,431	26,635	61,066	8.6	31,122	2,064	672	20.9	432	34.4	3,060	101	61.1
Union Pacific 1936	39,264	23,538	62,802	11.4	40,661	1,991	683	21.6	699	51.6	4,444	110	81.5
1935	42,262	19,928	62,190	15.0	38,260	1,923	641	21.1	605	49.3	3,831	106	73.8
Southwestern Region:													
Mo.-Kans.-Texas Lines 1936	4,442	5,478	9,920	6.3	29,495	1,636	592	21.7	727	52.6	2,201	79	60.8
1935	5,486	4,309	9,795	3.4	30,291	1,684	609	21.8	729	53.5	2,178	78	61.1
Missouri Pacific 1936	15,437	21,395	36,832	3.1	30,517	1,757	678	24.2	737	49.1	3,836	113	80.4
1935	17,205	19,501	36,706	3.3	29,080	1,652	613	23.4	591	41.3	3,037	118	69.8
St. Louis-San Francisco....1936	16,399	8,512	24,911	6.7	25,531	1,358	530	24.1	513	34.2	2,612	121	58.1
1935	19,291	5,603	24,894	5.1	24,379	1,343	534	24.4	457	30.2	2,322	120	50.5
St. Louis Southw. Lines...1936	2,855	2,864	5,719	3.7	28,076	1,529	592	20.5	750	53.7	2,522	88	63.1
1935	3,232	2,523	5,755	5.8	25,103	1,390	502	20.2	538	40.0	1,897	98	59.9
Texas & New Orleans.....1936	6,892	12,262	19,154	7.4	25,620	1,464	575	23.7	541	33.9	2,244	85	58.9
1935	7,190	10,518	17,708	9.2	23,695	1,327	474	21.8	426	30.5	1,655	88	52.2
Texas & Pacific.....1936	2,623	5,112	7,735	3.2	31,022	1,862	684	22.1	776	54.5	3,051	81	40.5
1935	2,605	4,308	6,913	4.9	29,151	1,738	612	20.7	705	51.7	2,512	80	36.4

Compiled by the Bureau of Statistics, Interstate Commerce Commission. Subject to revision.

Improved AUTOMATIC Slack Adjusters for Truck Mounting



Mounting brake cylinders on the truck instead of the car body is now practiced extensively because of the many advantages—both mechanical and pneumatic. . . . We have developed a new line of Automatic Slack Adjusters to co-ordinate with this form of brake rigging. Many improvements are incorporated, including the "divided engine" in which the adjuster piston and spring are located on opposite sides of the ratchet nut.

Various forms of this new type Adjuster are manufactured to permit attachment to the cylinder head, to the end of the truck frame, or to the side. . . . Several sizes are available to accommodate the braking forces determined by the particular form of brake lever arrangement.

WESTINGHOUSE AIR BRAKE COMPANY

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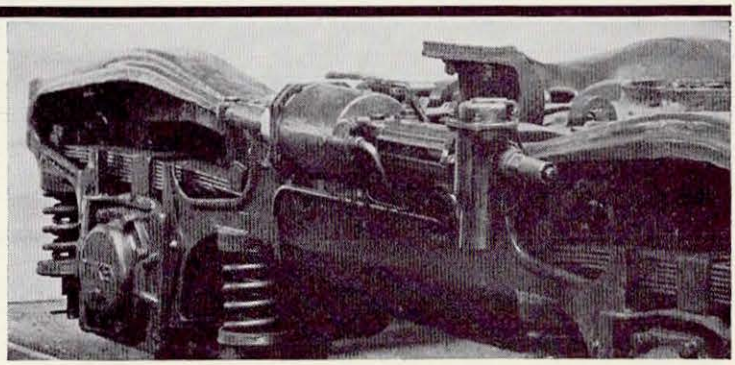
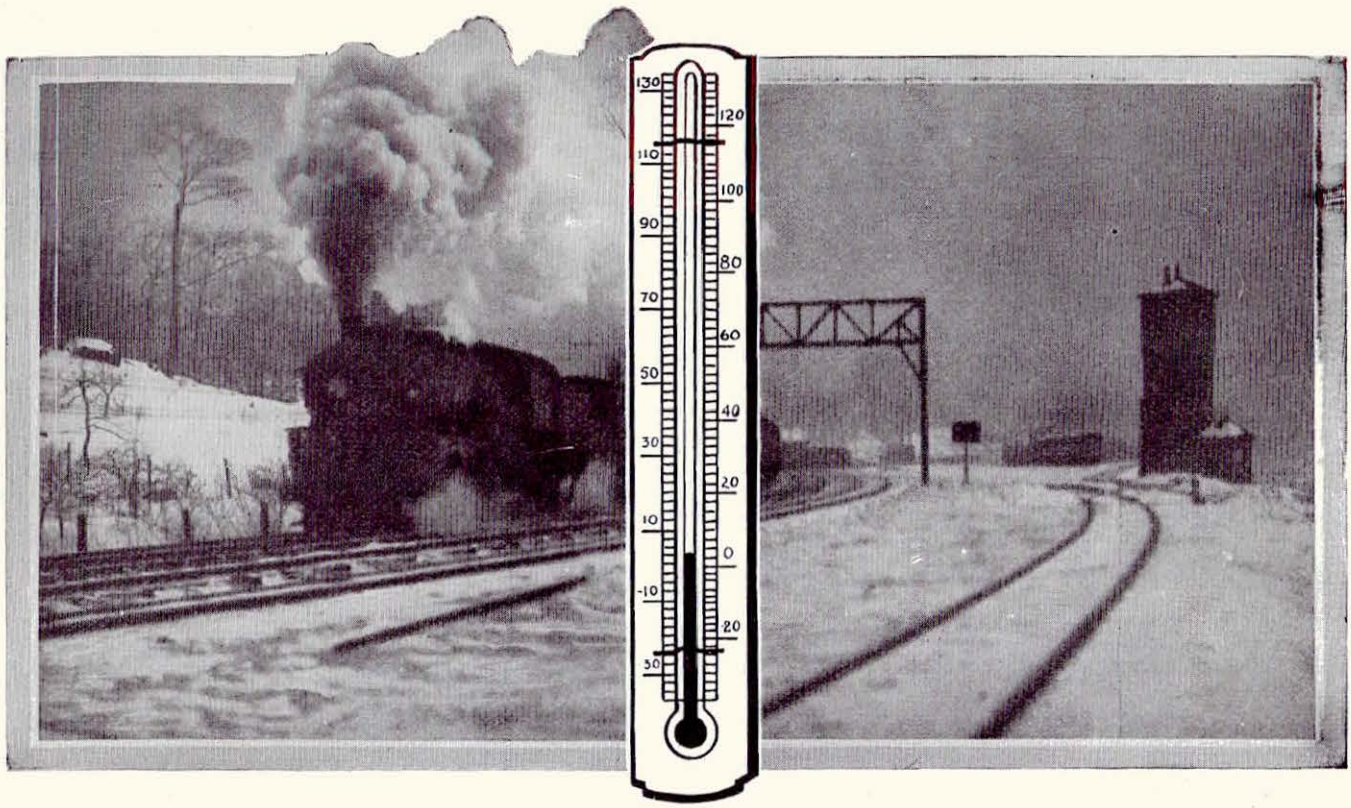


The illustration above shows our heavy duty Adjuster attached to the end of a truck frame; that to the right shows an Adjuster attached to the head of a cylinder mounted on the side of a truck frame.



Lower Winter Operating Costs

NOW is a good time to get your power in shape for those demoralizing days when "old man Winter" takes charge of operations.

Application of valve and cylinder wearing parts made from HUNT-SPILLER *Air Furnace* GUN IRON will help to insure maximum efficiency, reduce fuel consumption, prevent delays and lower maintenance costs.

The economies will help to pay for many of those expensive items which increase operating costs during Winter.

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Valve Bull Rings
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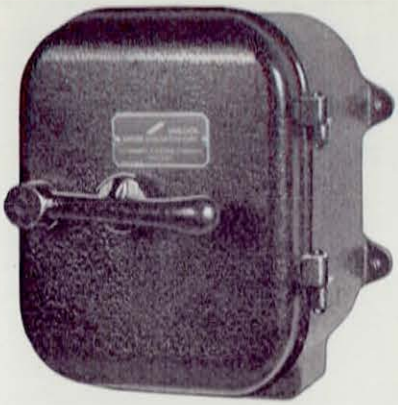

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(Monophone Type)

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For Railroad Use

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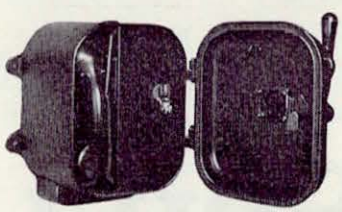

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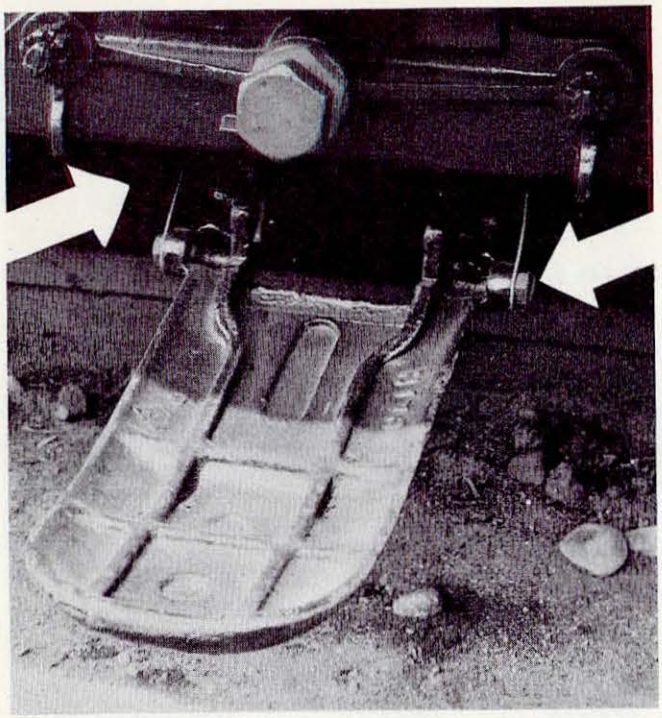

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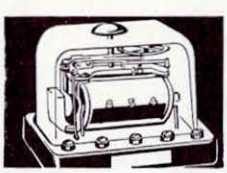

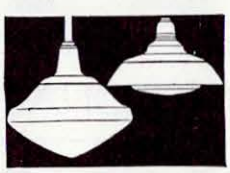
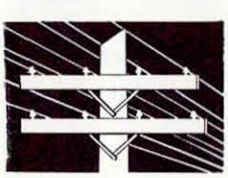
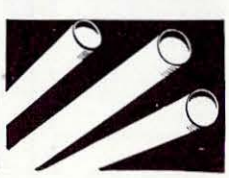

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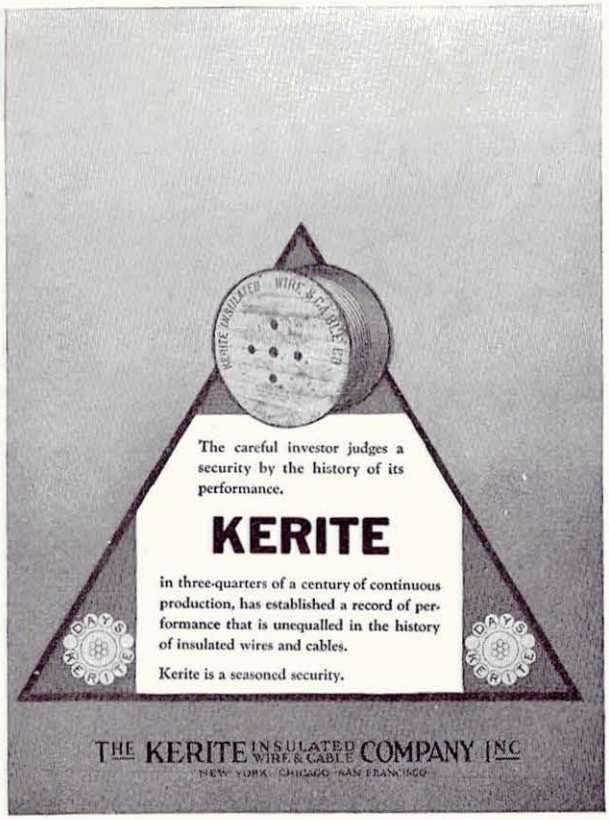
WANTED—Driving Wheel Lathe, 65" Swing, 7'6" Center to Center Minimum, Single or Double Head. Write particulars. M. E. Franklin, Purchasing Agent, Trona Railway, Trona, California.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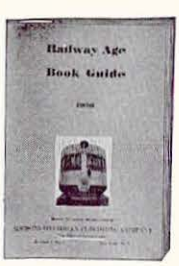
Water Conditioning

Railway Age Book Guide



Here is a handy reference booklet on railroad books that are of interest to readers of "Railway Age." In it are described practically all of the books published during the past decade that are in print. They are classified under subject headings and arranged in chronological order. A title index in the back facilitates quick reference.

SUBJECT INDEX

Accounting — Administration — Consolidation — Co-ordination — Economics — Finance — General — History — Law — Officers — Personnel — Rates — Regulation — Statistics — Traffic Management — Valuation.

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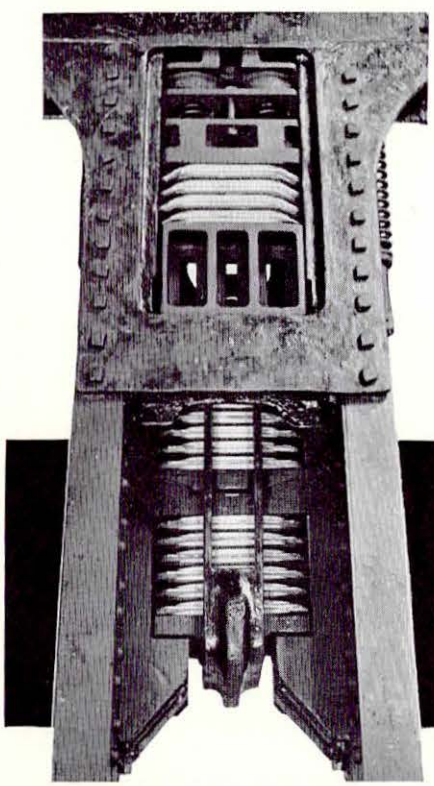

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*Signal Section Proceedings, Vol. XXVIII, p. 381

UNION SWITCH & SIGNAL COMPANY
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165

HISTORY IN THE MAKING

As of January 1, 1936, there were more than 900 installations of train operation by signal indication on about 70 railroads, covering approximately 36,000 miles of track.